Non-LM Bifurcation Revascularization 2022

Guideline and Concept Changes

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Non-LM Bifurcation PCI

Concept First !

Clinical Outcomes of Non-LM Bifurcation PCI Are Clearly Related with Main Branch Stenting Status.

Non-LM Bifurcation PCI

Concept First !

If the Side Branch is Small (80% in Non-LM Bifurcation), Before or After the Procedure

In Any Case, Do Not Touch the Side Branch!

That's All !

Indications of

Coronary Artery Revascularization

for Patients with Stable Ischemic Heart Disease

1. **To Improve Symptoms**
2. **To Improve Survival**

J Am Coll Cardiol. Dec 09, 2021. Epublished DOI: 10.1016/j.jacc.2021.09.006

Indications of
Coronary Artery Revascularization
for Patients with Stable Ischemic Heart Disease

1. To Improve Symptoms

Symptoms **can be very much subjective from a *D*octor's point of view.**

Indications of
Coronary Artery Revascularization
for Patients with Stable Ischemic Heart Disease

1. To Improve Symptoms

Should Be Ischemic Symptoms

Indications of
Coronary Artery Revascularization
for Patients with Stable Ischemic Heart Disease

1. To Improve Symptoms
2. **To Improve Survival**

J Am Coll Cardiol. Dec 09, 2021. Epublished DOI: 10.1016/j.jacc.2021.09.006

2021 ACC/AHA/SCAI, Guideline for Coronary Artery Revascularization *To Improve Survival,*

1. **Left Main Disease**
2. **Multi Vessel Disease (<50% EF),** CABG (1, 2a)
3. **Multi Vessel Disease (>50% EF),**
   Any Revascularization (2b)
4. **Diabetic 3 Vessel Disease,** CABG (1a),
   If They are Poor Candidates for CABG,
   PCI May be Considered (2a, B-NR).

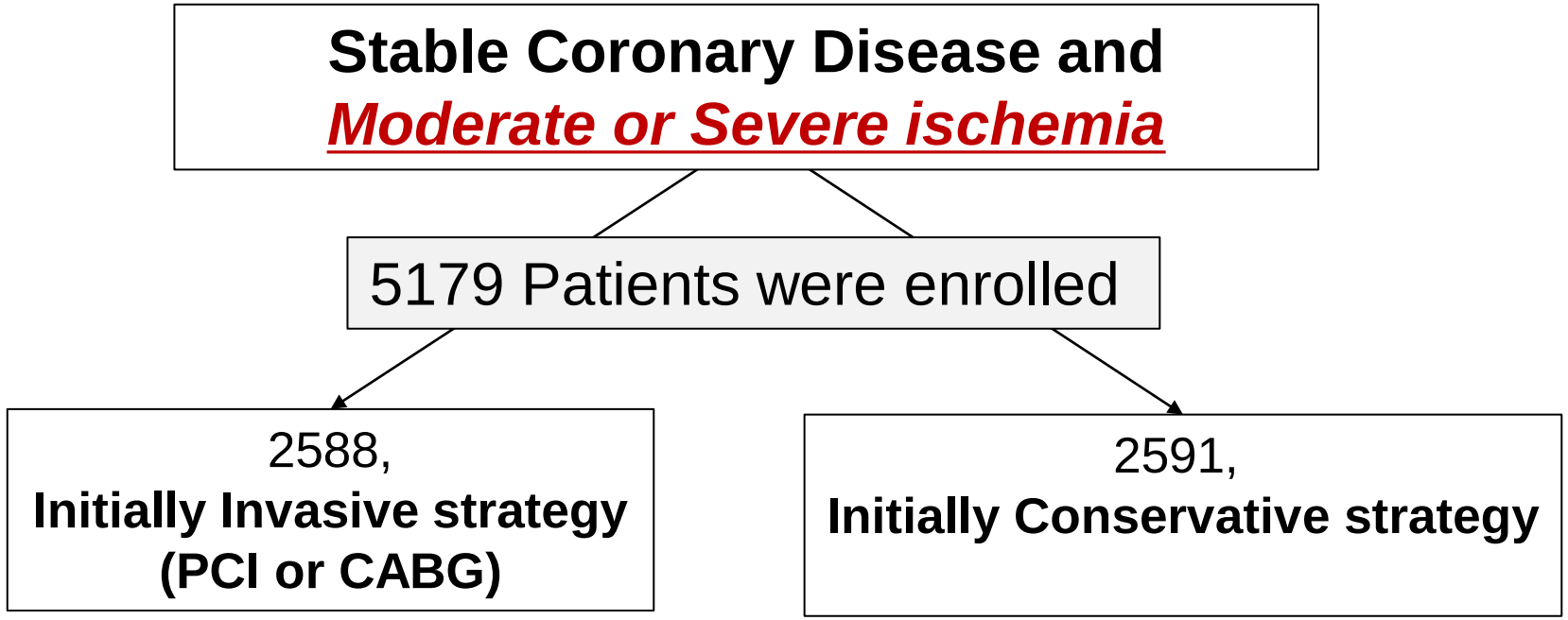
J Am Coll Cardiol. Dec 09, 2021. Epublished DOI: 10.1016/j.jacc.2021.09.006

Let me First Remind You of the ISCHEMIA study !

"ISCHEMIA is The Most Impactful Study since COURAGE,"

Jay Giri, MD said,

ISCHEMIA Study



The primary outcome; composite of death from cardiovascular causes, myocardial infarction, or hospitalization for unstable angina, heart failure, or resuscitated cardiac arrest.

David J. Maron et al, for the ISCHEMIA Research Group, N Engl J Med 2020; 382:1395-1407
https://www-nejm-org-ssl.libproxy.amc.seoul.kr/doi/10.1056/NEJMoa1915922

Ischemia Eligibility Criteria

Stress Test Modality	Diagnostic criteria
Nuclear perfusion via SPECT or PET	≥10% myocardium ischemic[1]
Echocardiography	≥3/16 segments with stress-induced severe hypokinesis or akinesis
Cardiac Magnetic Resonance	Perfusion: ≥12% myocardium ischemic, and/or Wall motion: ≥3/16 segments with stress-induced severe hypokinesis or akinesis
Exercise Test without Imaging[2] (criteria 1-4 must all be met)	1. Clinical history of typical angina or typical angina during the exercise test 2. Absence of resting ST-segment depression ≥1.0 mm or confounders that render exercise ECG non-interpretable (LBBB, LVH with repolarization, pacemaker, etc.) 3. As compared to the baseline tracing, additional exercise-induced horizontal or downsloping ST-segment depression ≥1.5 mm in 2 leads *or* ≥2.0 mm in any lead; ST-segment elevation ≥1mm in a non-infarct territory. 4. Either of the following: a. Workload at which ST-segment criteria are met is not to exceed completion of stage 2 of a standard Bruce protocol or 7 METs if a non-Bruce protocol is used *or* b. ST segment criteria are met at <75% of the maximum predicted HR *Note: Anatomic eligibility must be confirmed*

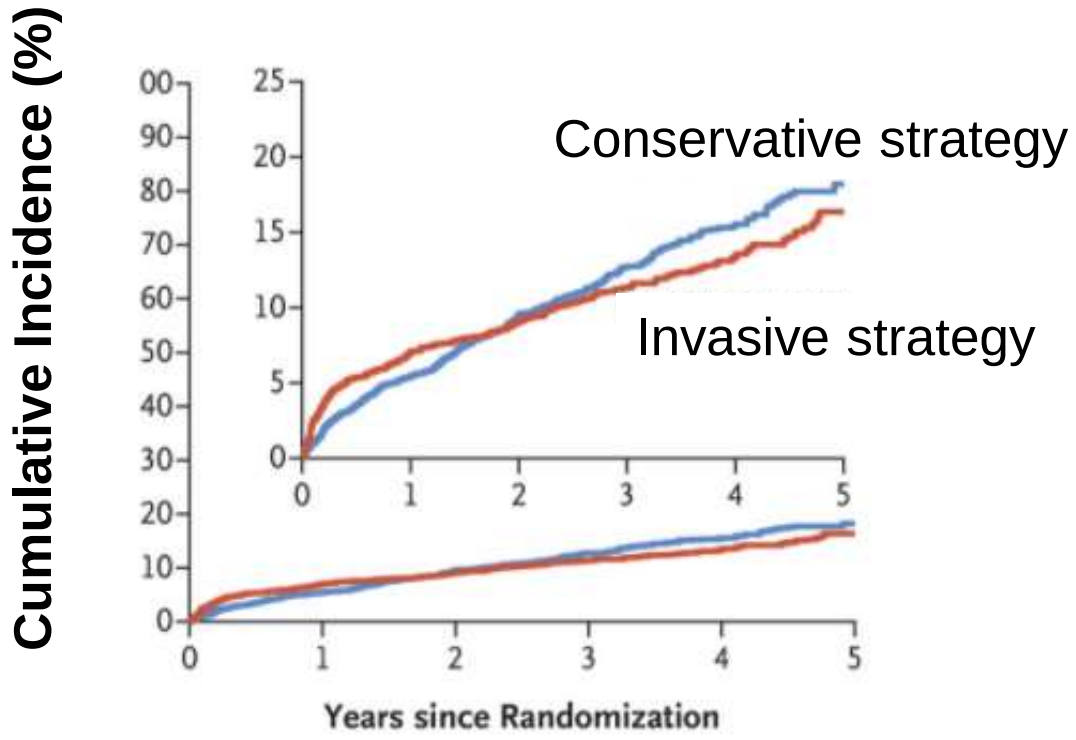
Coronary Anatomy by CCTA (≥ 50% stenosis)

	Total (N=5179)	INV (N=2588)	CON (N=2591)
0	0.1% (4/2986)	0.1% (2/1490)	0.1% (2/1496)
1	23.3% (697/2986)	24.2% (360/1490)	22.5% (337/1496)
2	31.4% (938/2986)	29.1% (434/1490)	33.7% (504/1496)
3	45.1% (1347/2986)	46.6% (694/1490)	43.6% (653/1496)

Multivessel Disease >75%

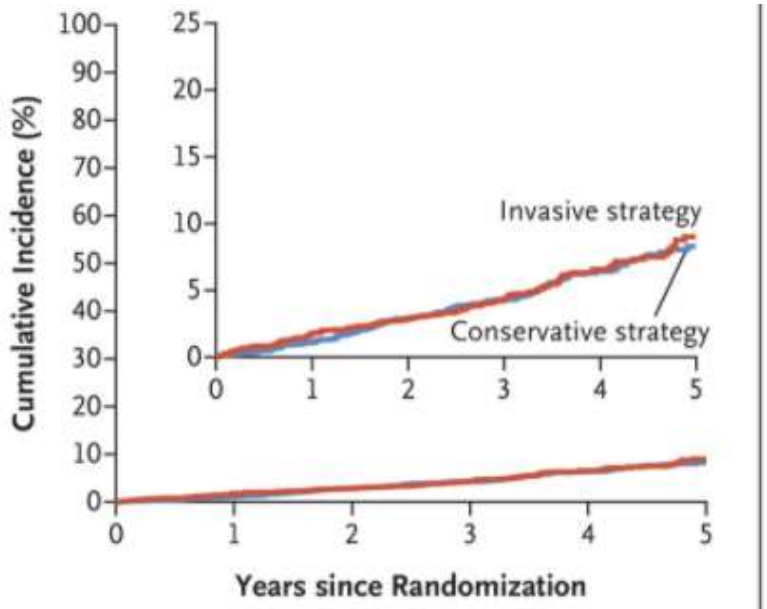
Primary Composite Outcomes at 3.2 yrs

Death from cardiovascular causes, Myocardial infarction, or Hospitalization for unstable angina, Heart failure, or Resuscitated cardiac arrest.



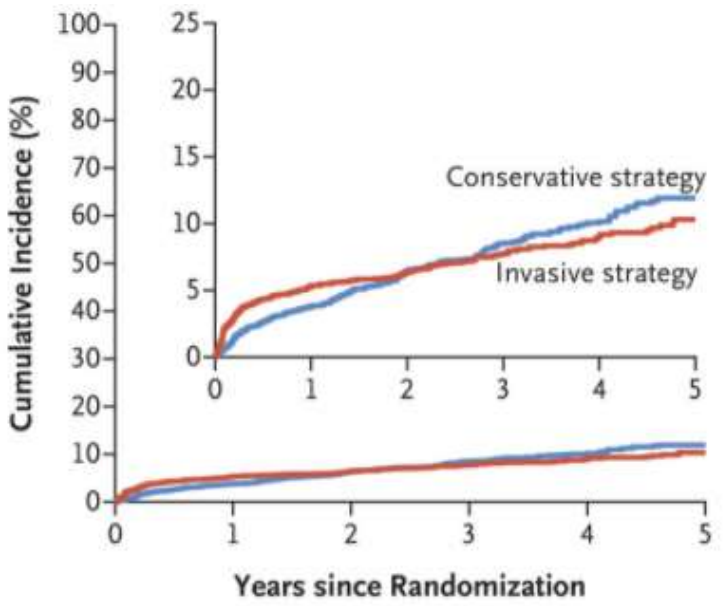
No. at Risk						
Conservative strategy	2591	2431	1907	1300	733	293
Invasive strategy	2588	2364	1908	1291	730	271

Death from Any Cause



No. at Risk						
Conservative strategy	2591	2548	2065	1445	844	349
Invasive strategy	2588	2518	2061	1431	827	317

Myocardial Infarction

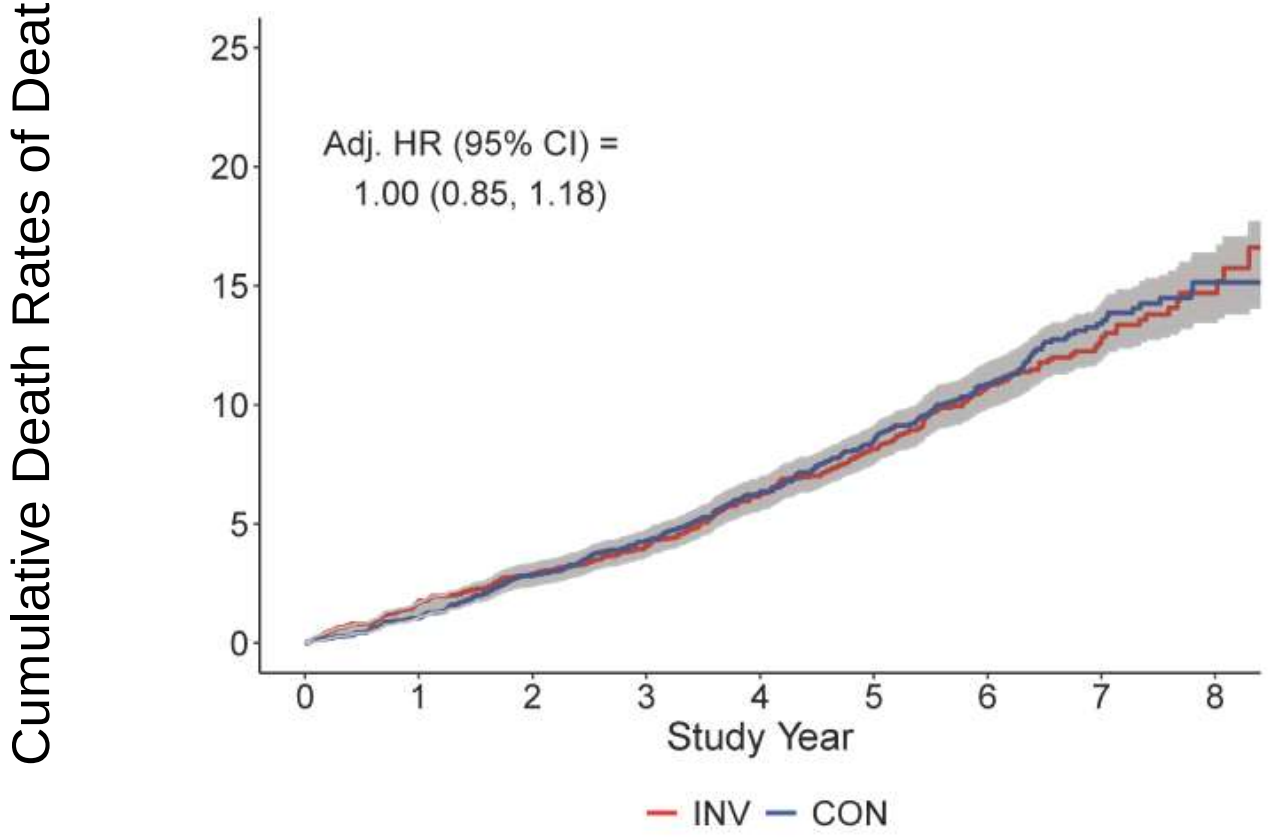


No. at Risk						
Conservative strategy	2591	2452	1931	1321	747	298
Invasive strategy	2588	2379	1931	1313	742	283

ISCHEMIA-EXTEND- ***All Death***

Extended Follow-up 5.7 years median

Main Message Doesn't Change!



Nearly Identical

Judith S. Hochman et al, AHA, 2022, 10.1161/CIRCULATIONAHA.122.062714

ISCHEMIA study

No Survival and Ischemic Event Benefit of Invasive Strategy, as Compared With Conservative Strategy For the Patients with Moderate or Severe Ischemia. (>75% Multi-Vessel Disease included).

Judith S. Hochman et al, AHA, 2022, 10.1161/CIRCULATIONAHA.122.062714
David J. Maron et al, for the ISCHEMIA Research Group, N Engl J Med 2020; 382:1395-1407

Main Message
form ISCHEMIA study

Optimal Medical Therapy Is Good Enough for Majority Patients of Stable Coronary Disease,
And So, We Have to Think About Unnecessary Revascularization (esp. PCI) !

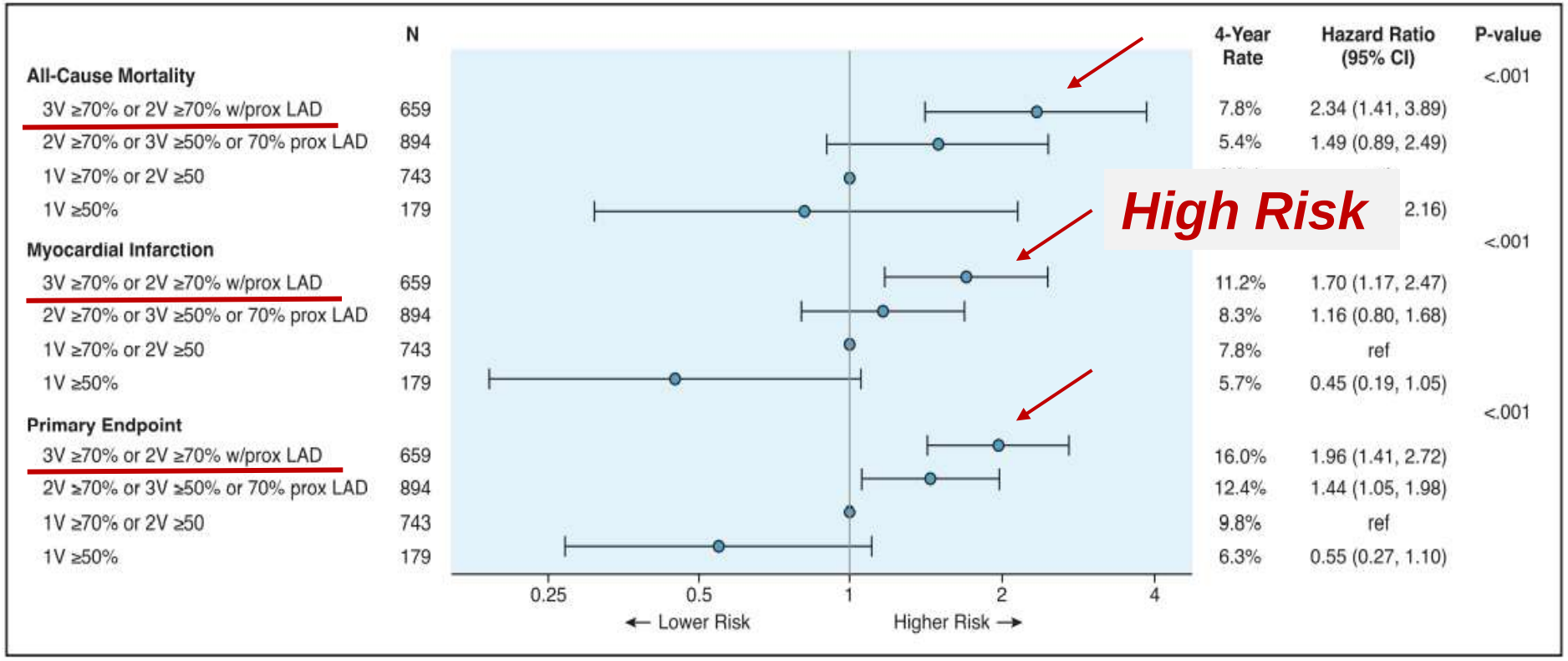
David J. Maron et al, for the ISCHEMIA Research Group, N Engl J Med 2020; 382:1395-1407

Suggested Treatment Strategy
form ISCHEMIA study

Individualized Treatment !

David J. Maron et al, for the ISCHEMIA Research Group, N Engl J Med 2020; 382:1395-1407

Coronary Artery Disease Severity
and Clinical Outcomes



ISCHEMIA Study, Circulation. 2021;144:1024–1038. DOI: 10.1161/CIRCULATIONAHA.120.04975

Individualized *Risk Stratification*

by ISCHEMIA Criteria

High Risk,
3VD >70% or
2VD >70% with pLAD,

Intermediate Risk,
2VD >70% or 3VD >50%
or >70% pLAD,

Low Risk,
1VD >70% or 2 D >50%
Any 1VD >50%

Revascularization
+ Medical Therapy

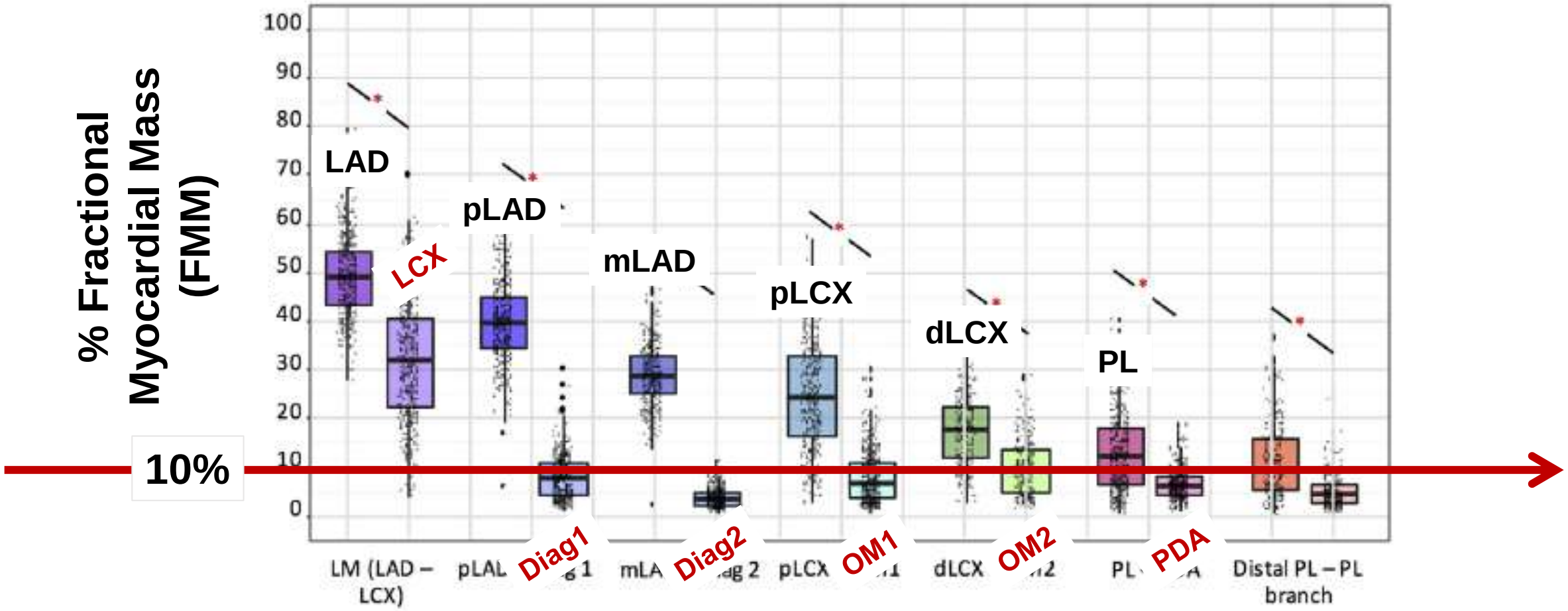
Medical Therapy Alone
Is Enough !

Non-LM Bifurcation Disease

Real Size ?

% Fractional Myocardial Mass (FMM)

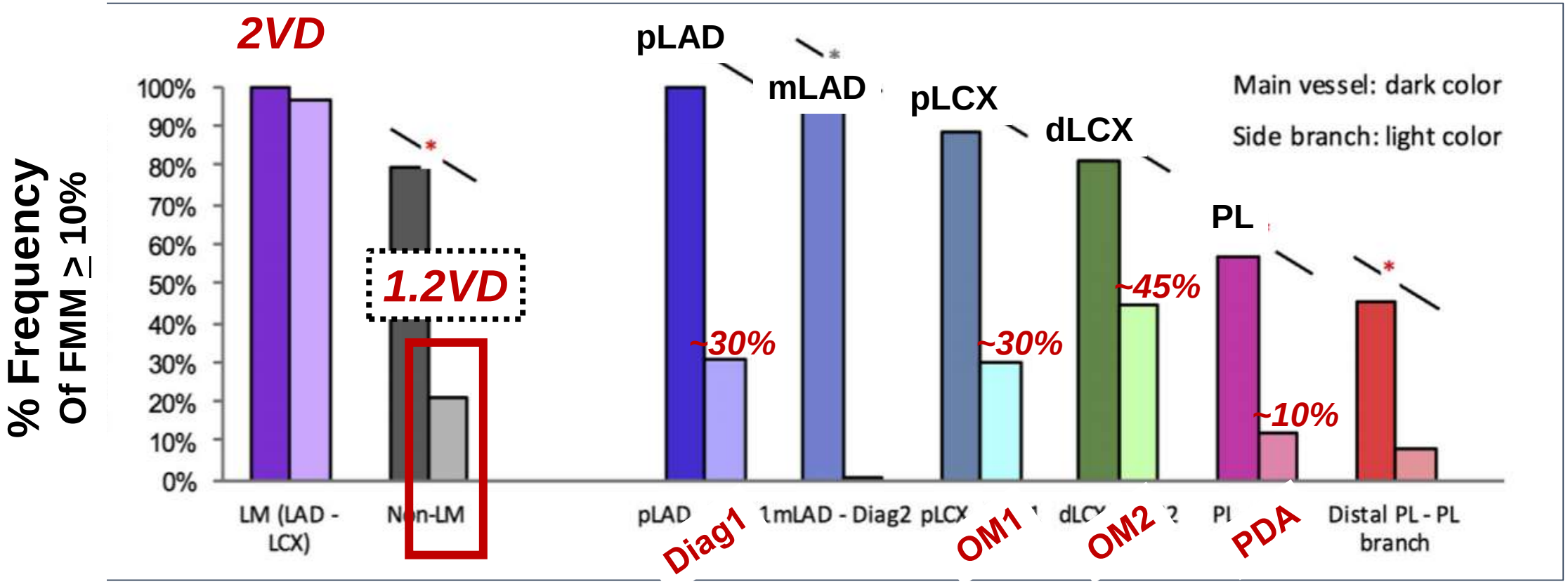
Main Vessel or Side Branch
Fractional Myocardial Mass (FMM)



Kim HY, et al. JACC Intv 2017;10:571–81

Main Vessel or Side Branch

Frequency of Fractional Myocardial Mass >10%



***Only 20%* of Side branch has >10% FMM**

Kim HY, et al. JACC Intv 2017;10:571–81

Non-LM Bifurcation Disease

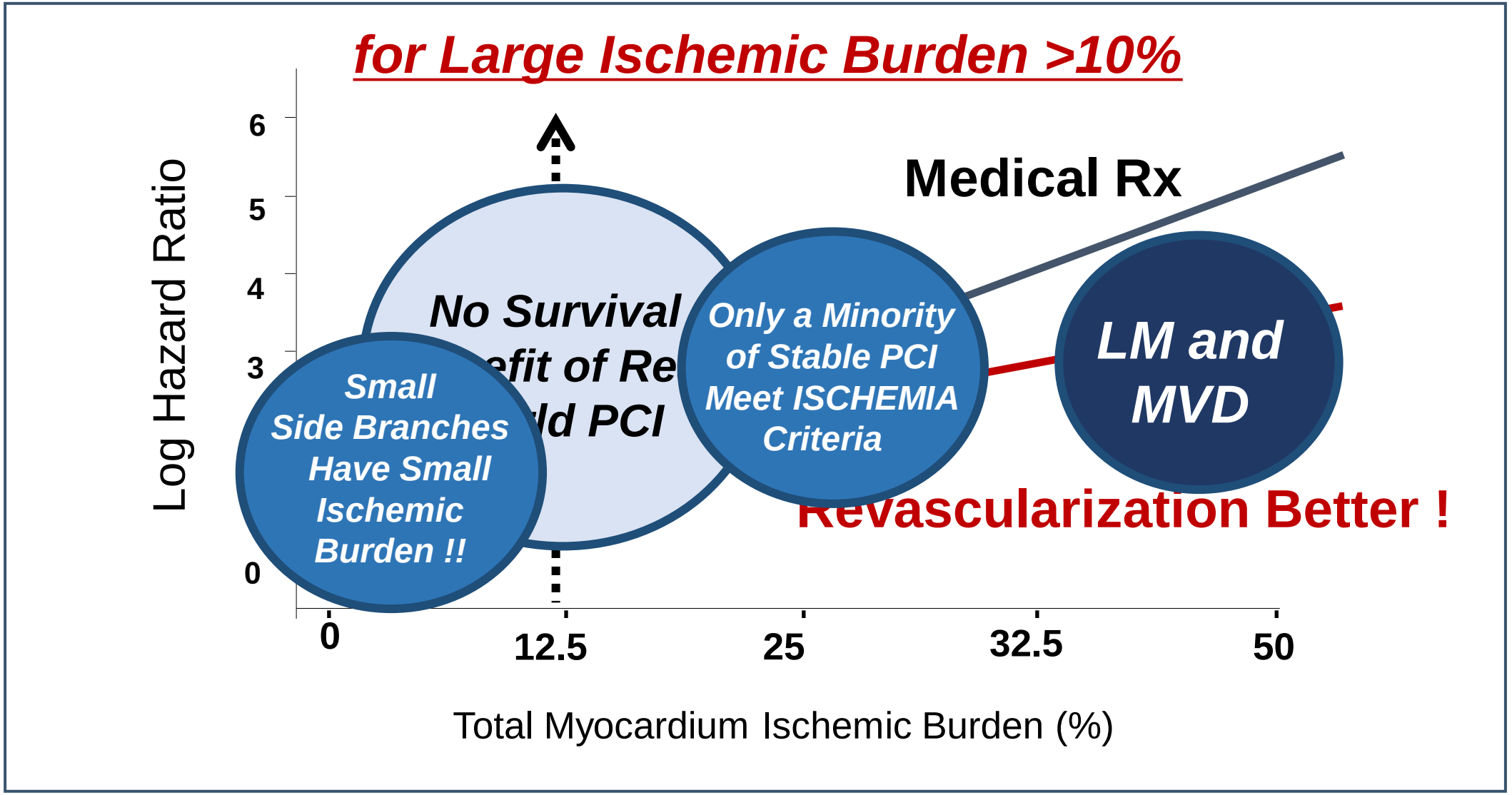
Concept First !

If You Look at ***Only One Non-LM Bifurcation Disease,*** *Think of It as Maximum,* ***It Would 1.2 Vessel Disease (20%)*** ***in Case of Large Side Branch >2.5mm.***

Non-LM Bifurcation Disease
Medical Disease !

If You Look at Only One Non-LM Bifurcation Disease, It Would 1.2 Vessel Disease in Case of Large Side branch >2.5mm.

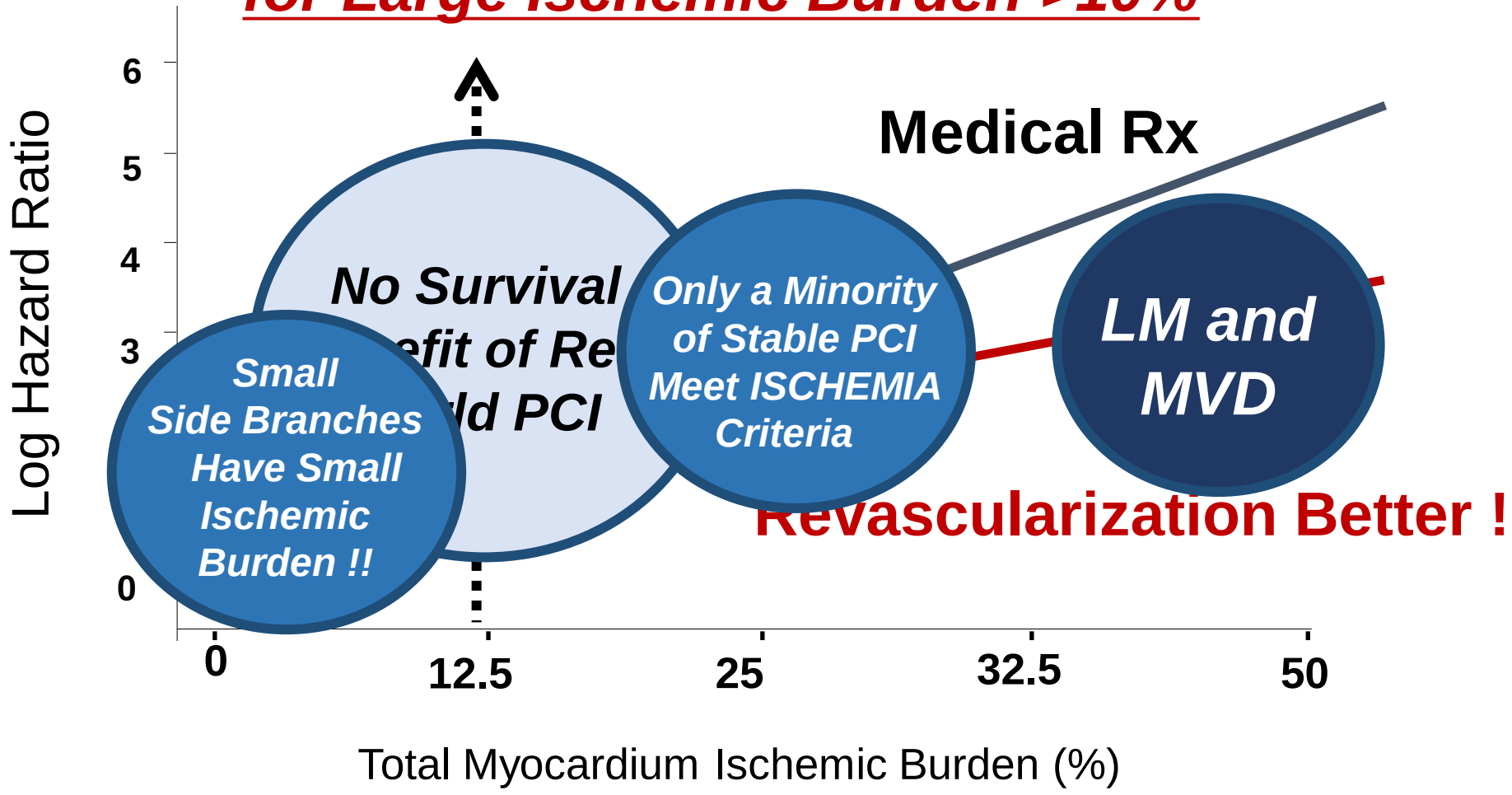
No Survival Benefit of Non-LM Bifurcation PCI



Modified Data from Hachamovitch R, Circulation. 2003;107:2900-2906

No Survival Benefit of Non-LM Bifurcation PCI

for Large Ischemic Burden >10%



Modified Data from Hachamovitch R, Circulation. 2003;107:2900-2906

Non-LM Bifurcation Disease

Clear Insight from ISCHEMIA Study

Medical Therapy Is Good Enough
for Majority Patients of Stable Non-LM Bifurcation Disease.

Non-LM Bifurcation PCI

How To Treat ?

1. ***Large Side Branch (>2.5mm), Treat !***
2. ***Small Side Branch, Don't touch !***

Non-LM Bifurcation PCI

Large Side Branch (>2.5mm)

1. ***Ture Bifurcation Disease (Medina 1,1,1);***

   Upfront 2 Stent Would Be Good !

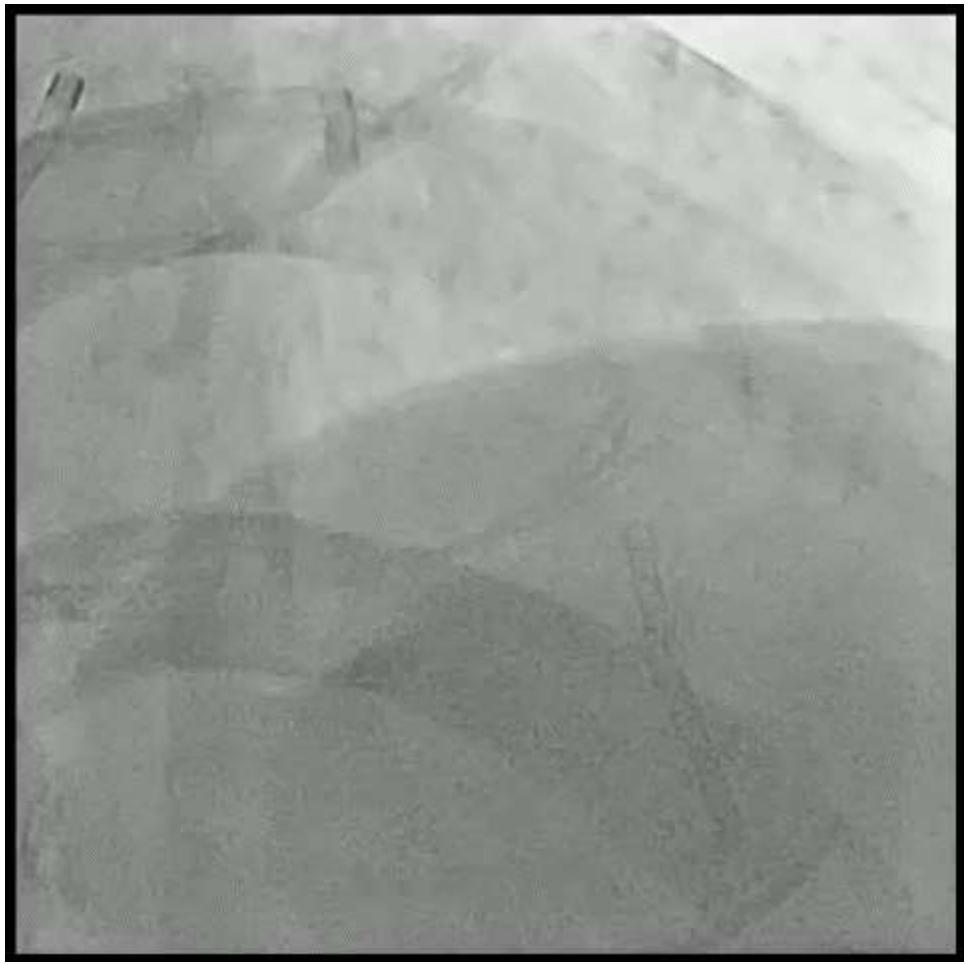
Upfront 2 Stent Strategies
For True Bifurcation Disease

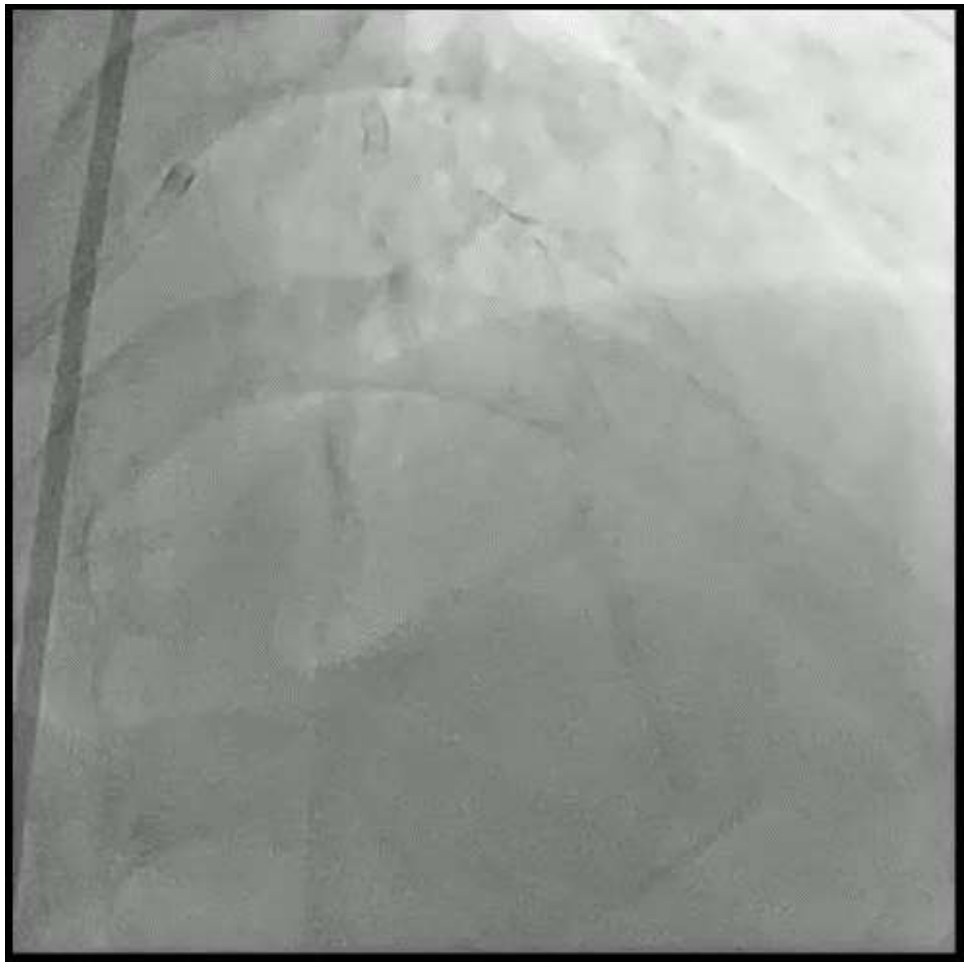
1. Large Side Branch Is Worthy of Treatment.
2. We Can Avoid Risk of SB closure.
3. Clinical Outcomes of 2 Stents Are Good.

Zhang JJ, Ye F, Xu K, et al. Eur Heart J 2020;Jun 26 (DEFINITION 2)
Kim YH, Park SJ, et al. JACC Interv. 2015 April 20;8(4):550-60 (CROSS)

M/55, Stable Angina, HT, Smoker, h/o PCI

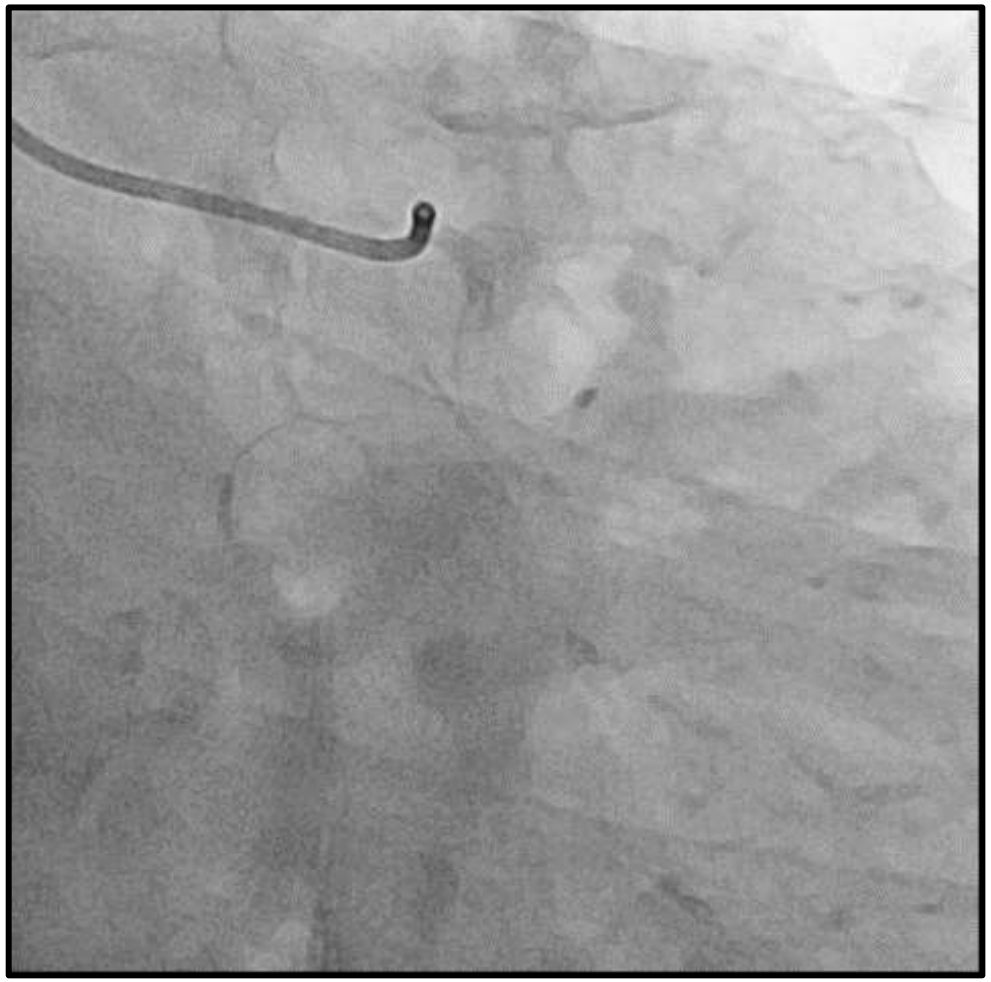
Upfront 2-Stenting for LAD & Diagonal

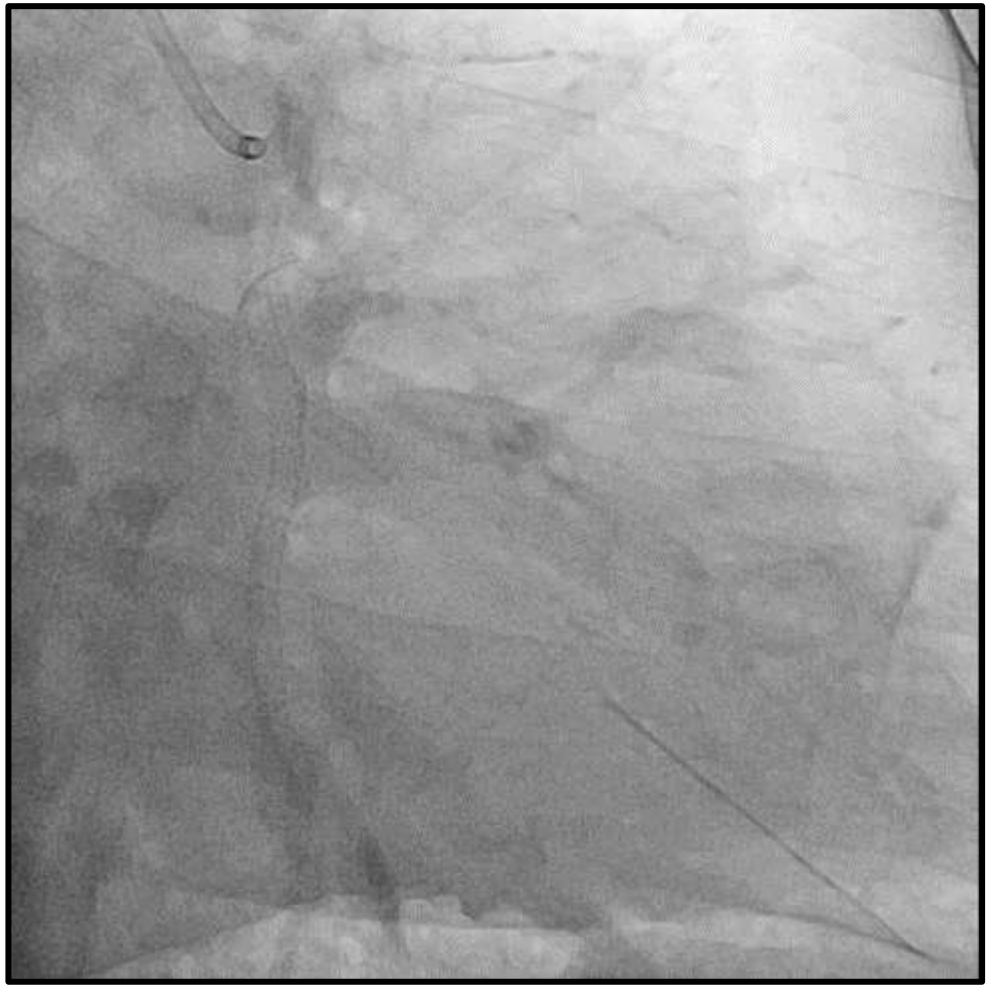




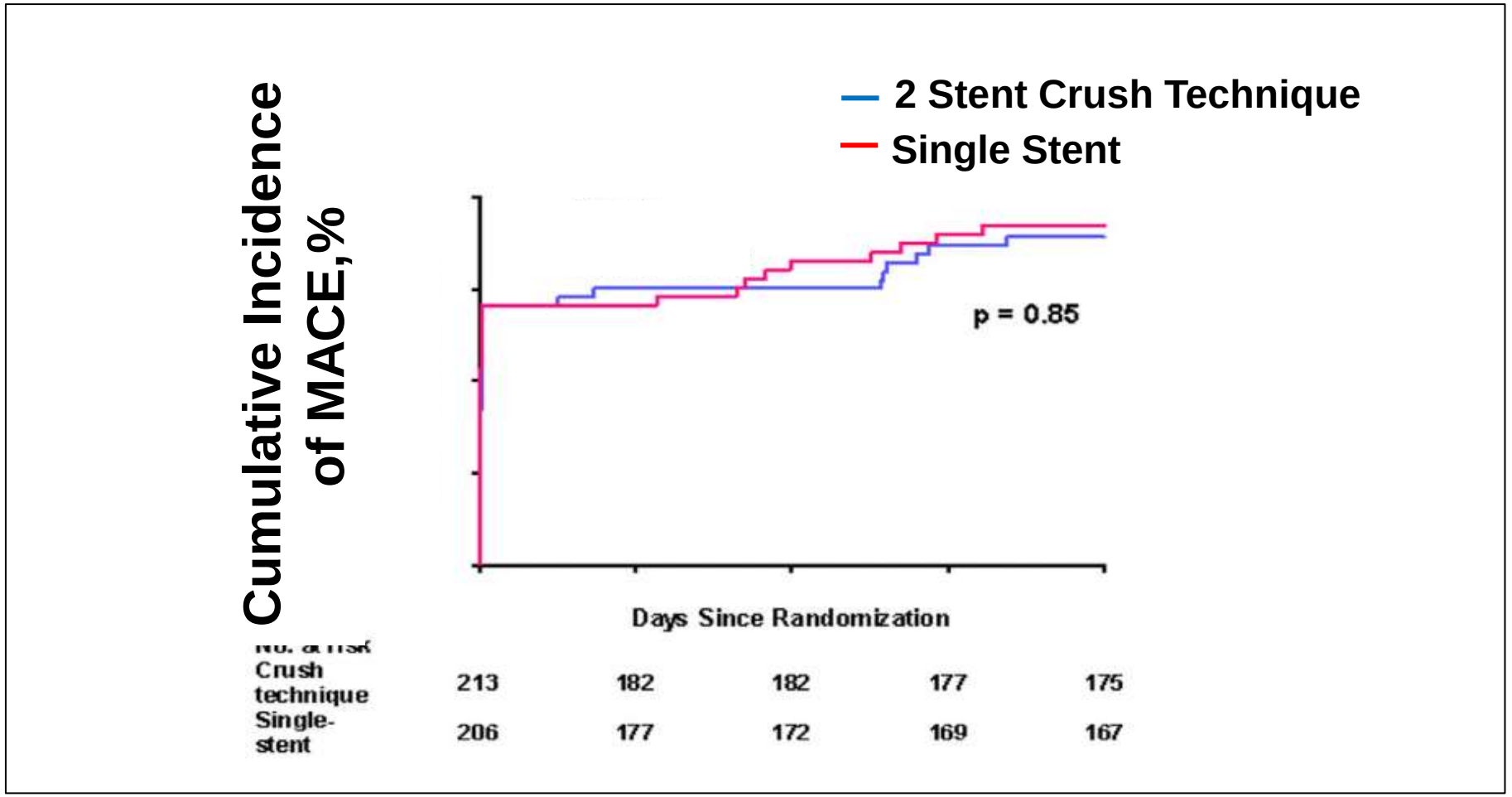
M/35, Stable Angina, Smoker

Upfront 2-Stenting for LCX & OM





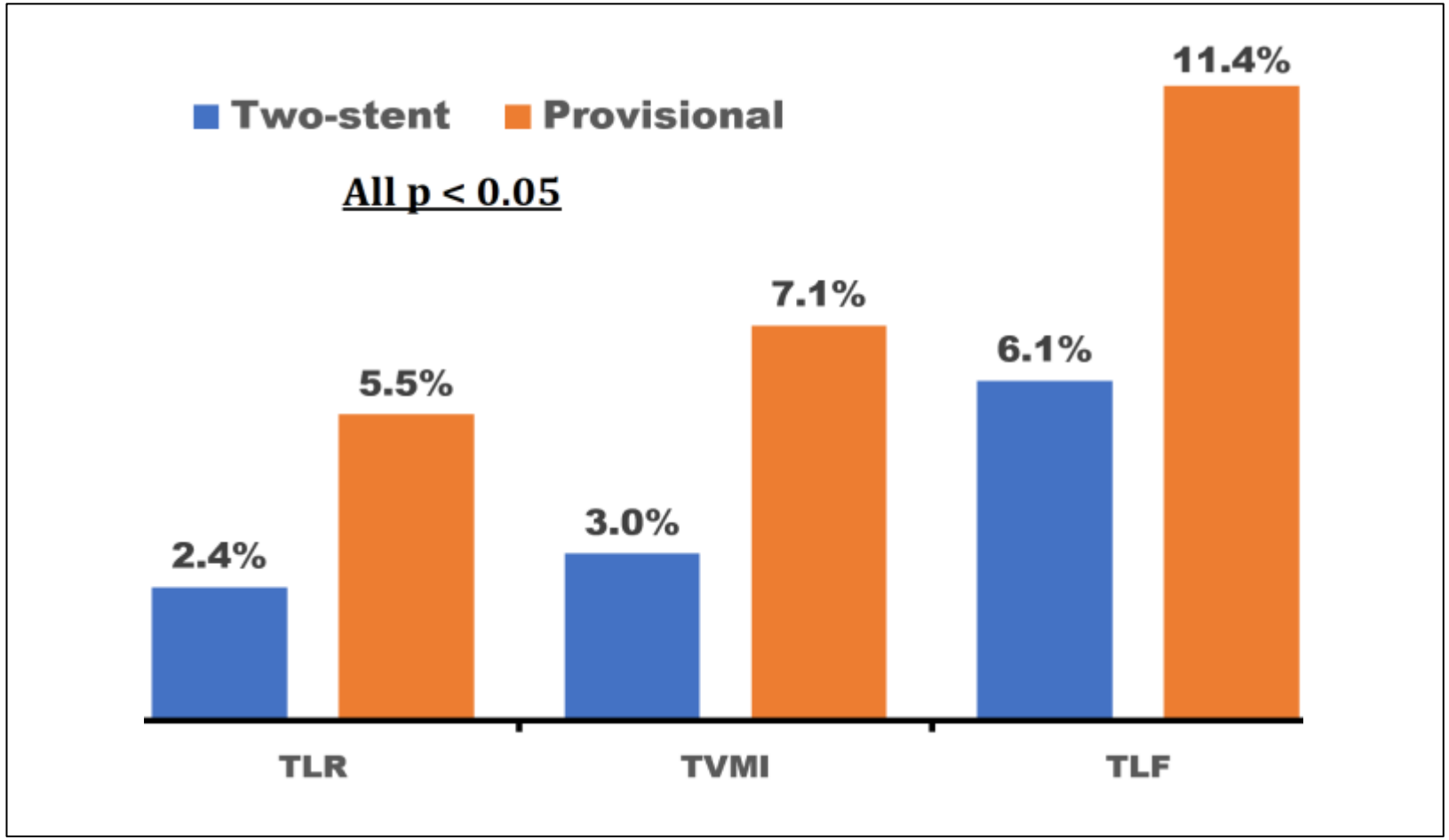
1 or 2 Stent Crush Technique



Kim YH, Park SJ, et al. JACC Interv. 2015 April 20;8(4):550-60, PERFECT Randomized Studies

2 Stent (DK Crush, Culotte) Is Better than Provisional 1 Stent

For All Complex Bifurcations (RVD>2.5mm)



Zhang, et al. Eur H J 2020, Definition II Randomized Study

Non-LM Bifurcation PCI

How To Treat ?

1. Large Side Branch (>2.5mm), Treat !
2. **Small Side Branch, Don’t touch !**

Non-LM Bifurcation PCI

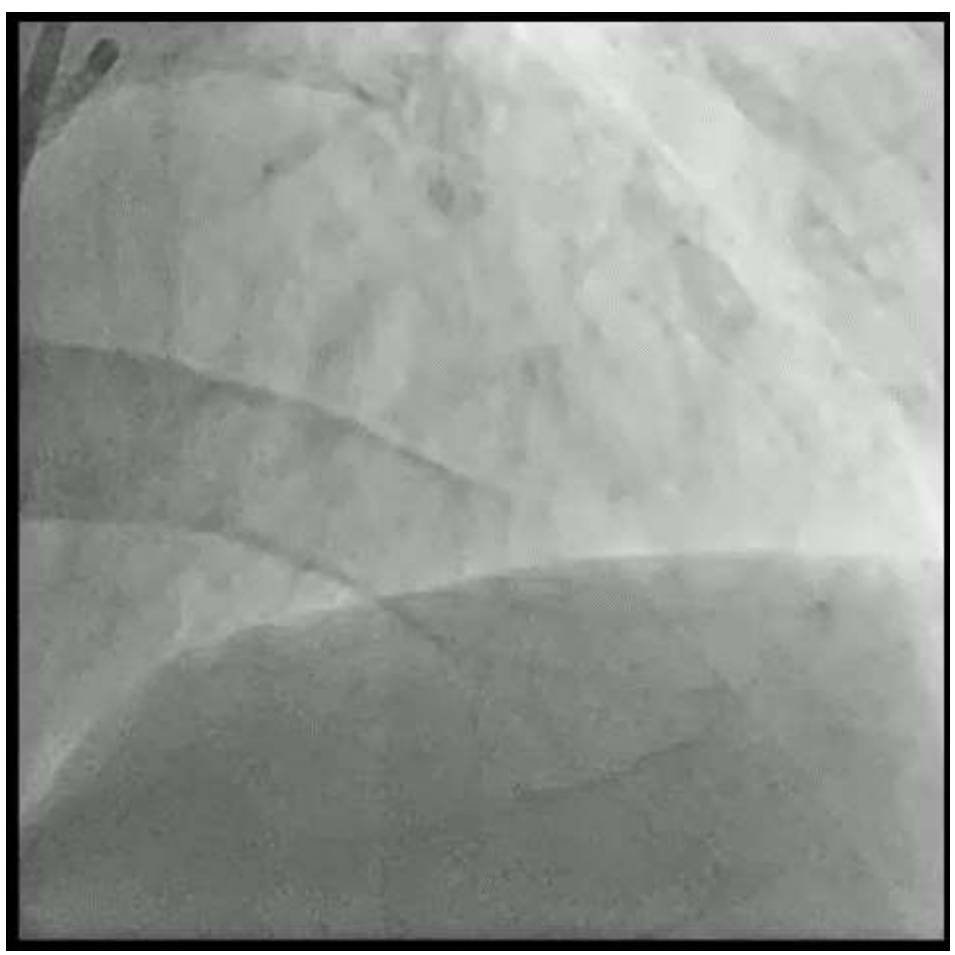
Small Side Branch (<2.5mm)

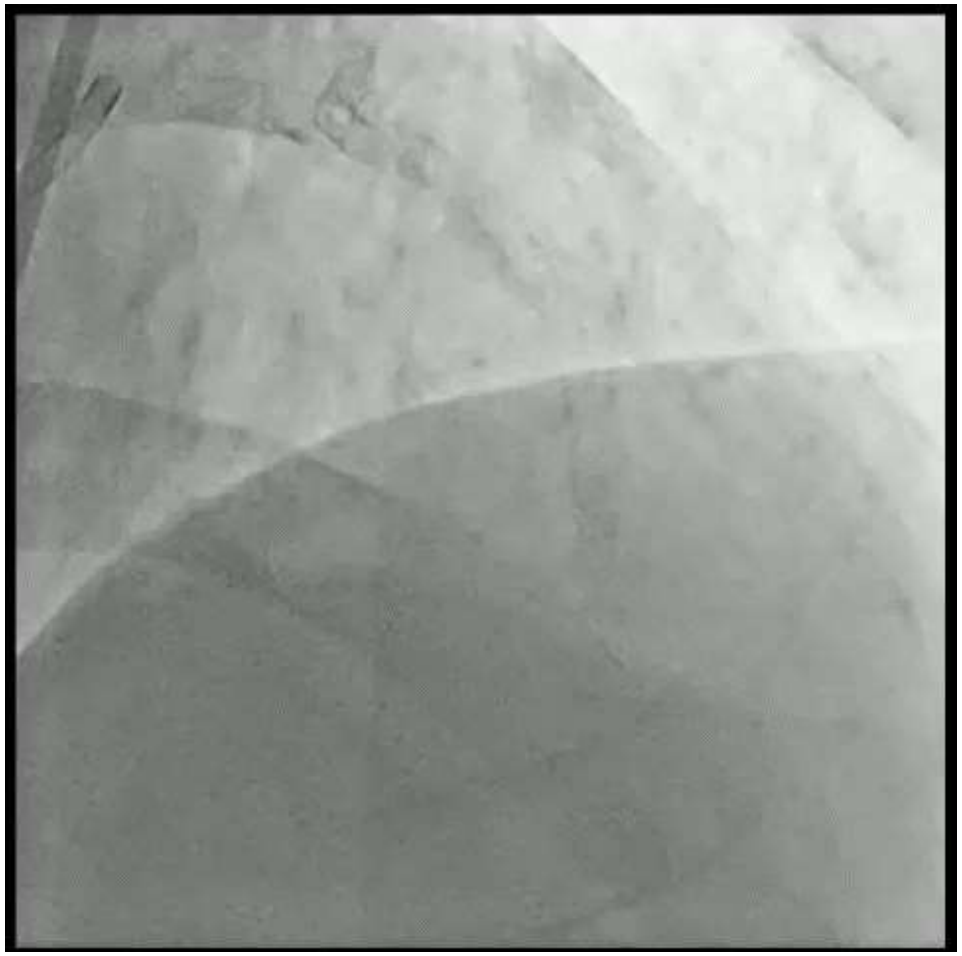
2. Main Vessel Stenting with

Cross Over Side branch

M/64, Stable Angina, HT, Dyslipidemia

LAD Stent Cross Over, TIMI 3 Flow Big Side branch





M/78, Stable Angina, DM, HT, Dyslpidemia

LAD Stent Cross Over, Diagonal Branch Was Jailed

Non-LM Bifurcation PCI

Jailed Side Branch

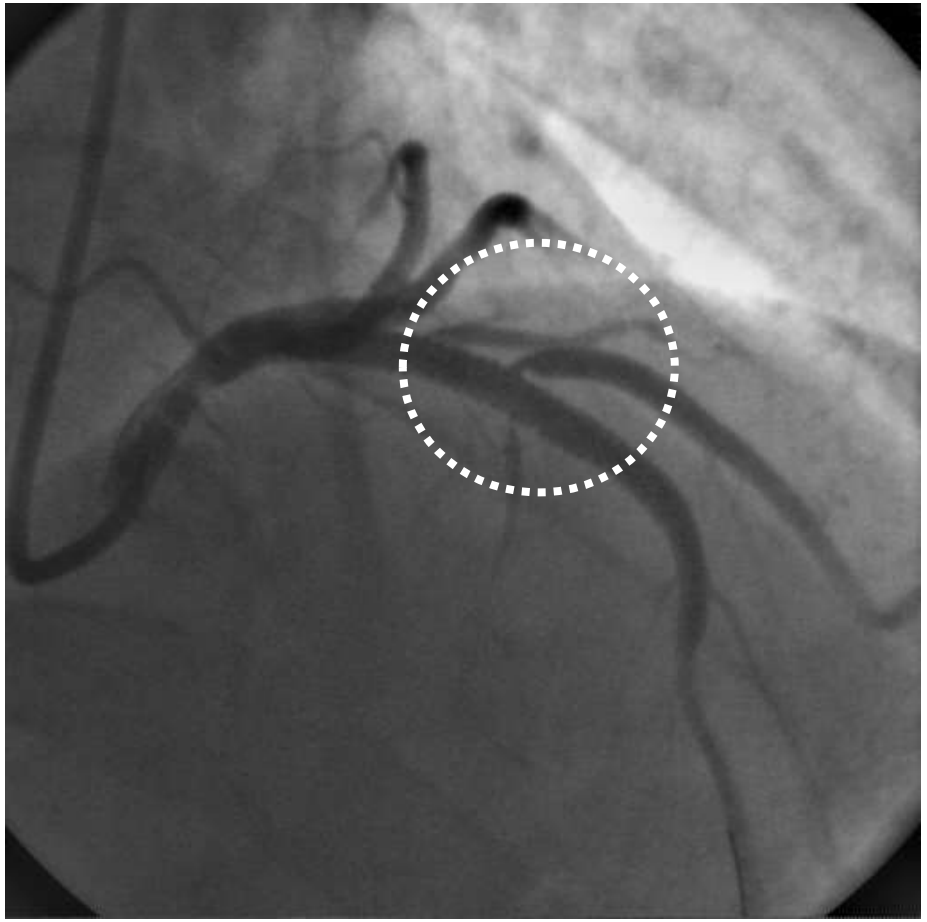
If No Symptoms,

No Survival Benefit,

Why Would You Do Further Treatment ?

M/65, Stable Angina,

LAD Cross Over, Big Side Branch Jailing, TIMI 3 Flow

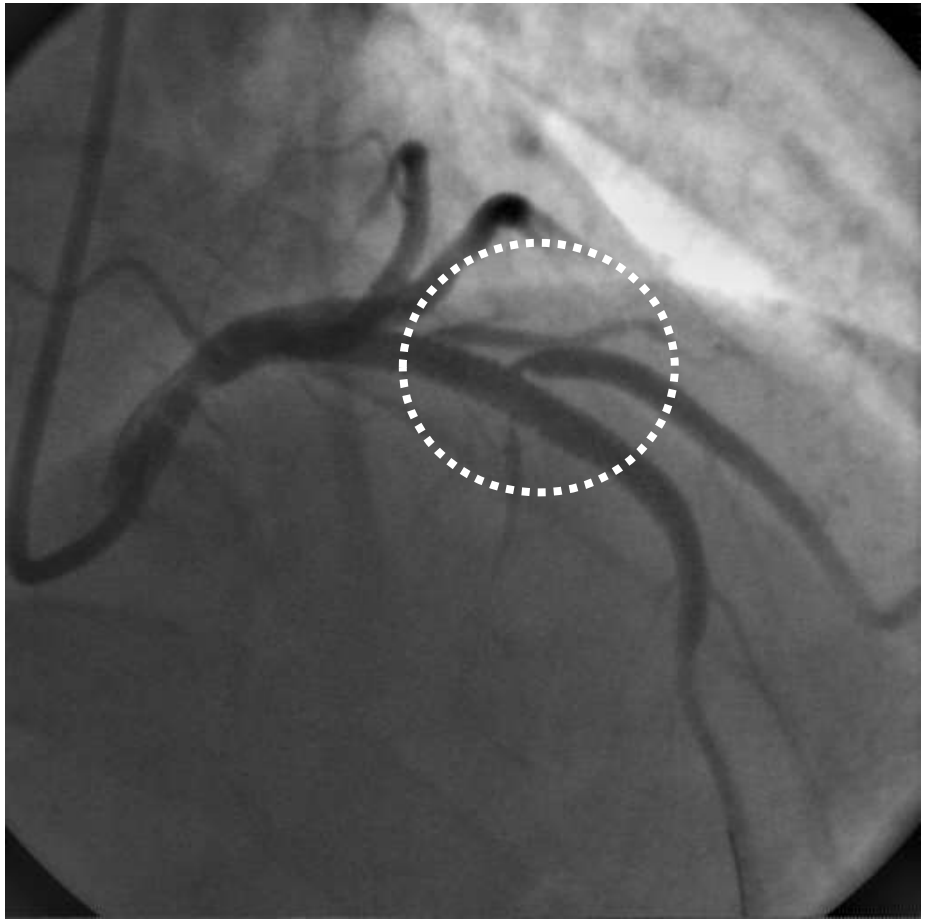


No Chest Pain ?

Leave It Alone !

M/65, Stable Angina,

LAD Cross Over, Big Side Branch Jailing, TIMI 3 Flow



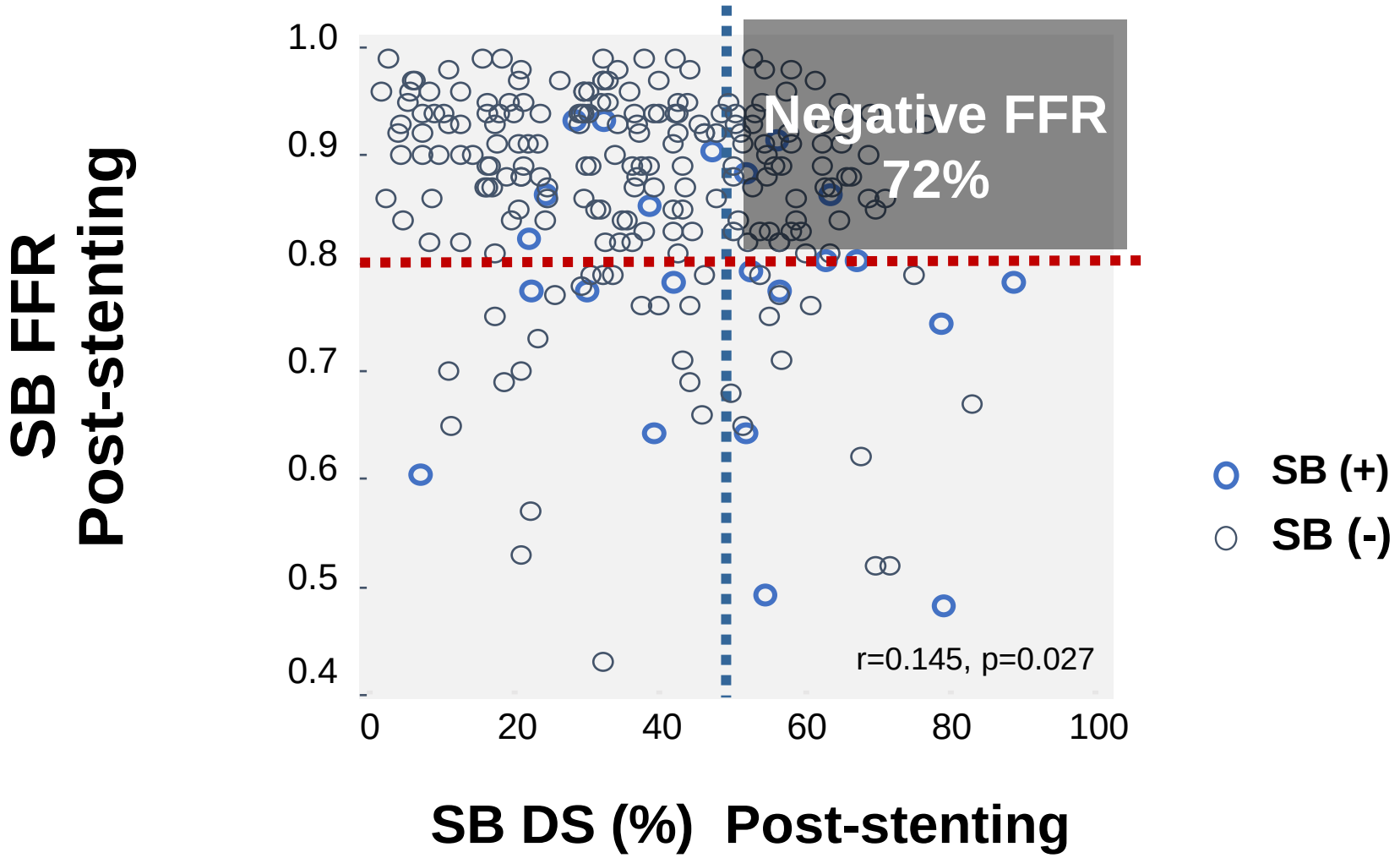
Why?

Leave It Alone !

1. FFR Would Be Negative (>70%).

Jailing Side Branch FFR

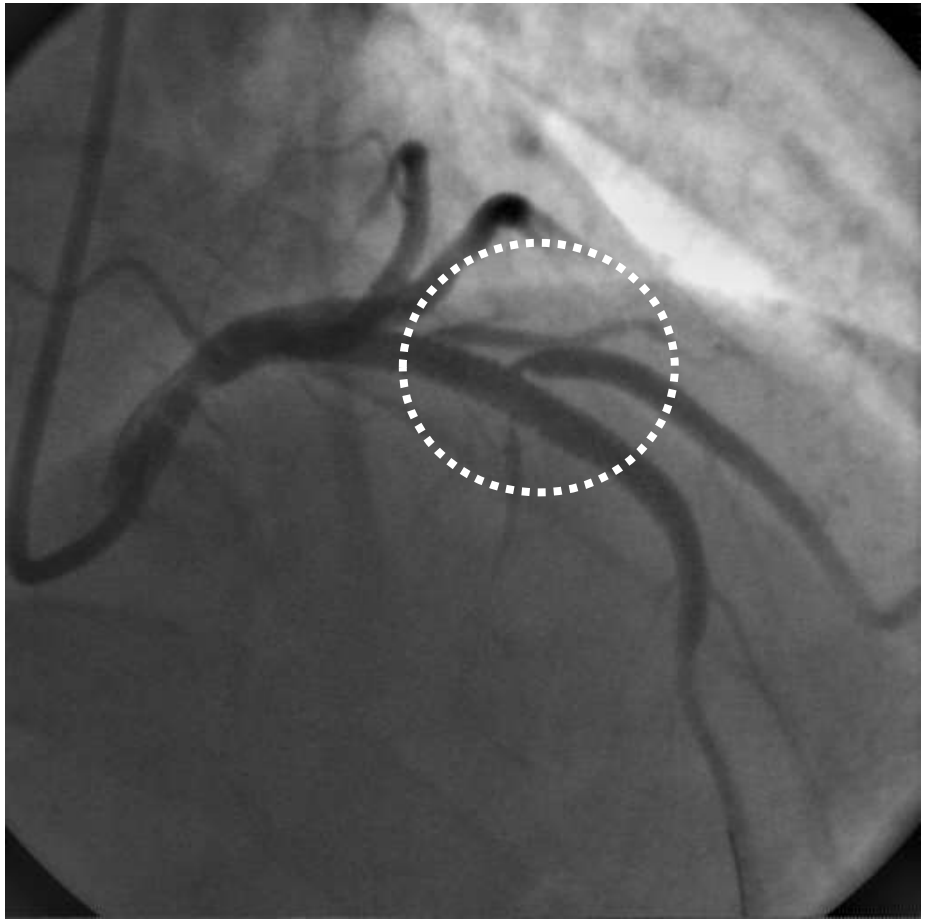
After Main Vessel Stenting (n=232)



Ahn JM et al, JACC Cardiovasc Interv. 2011 Feb;5(2):155-61

M/65, Stable Angina,

LAD Cross Over, Big Side Branch Jailing, TIMI 3 Flow



Why?

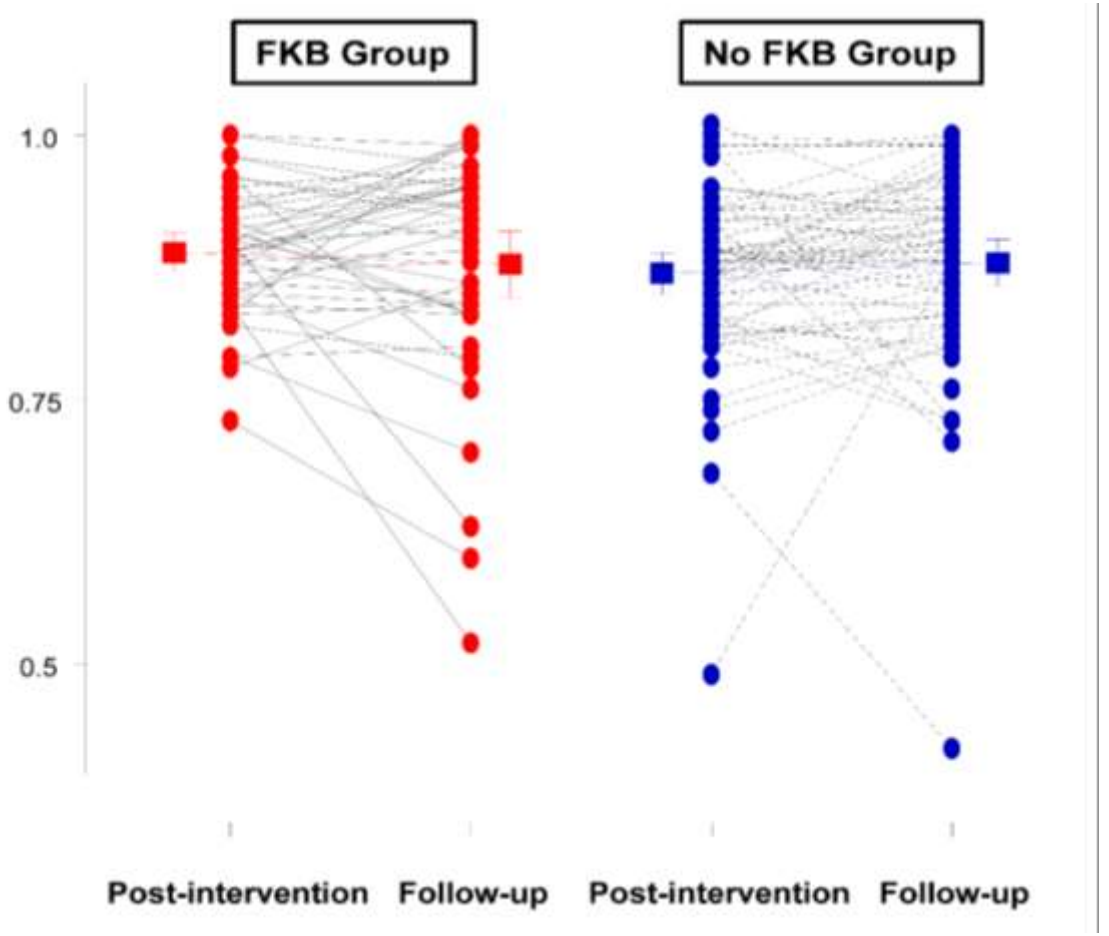
Leave It Alone !

1. FFR Would Be Negative (>70%).
2. Aggressive Treatment
   Paradoxically Increased TVF.

Kissing Balloon Inflation

Can Not Make An Any Difference!

Serial FFR follow-up in Jailed Side Branch



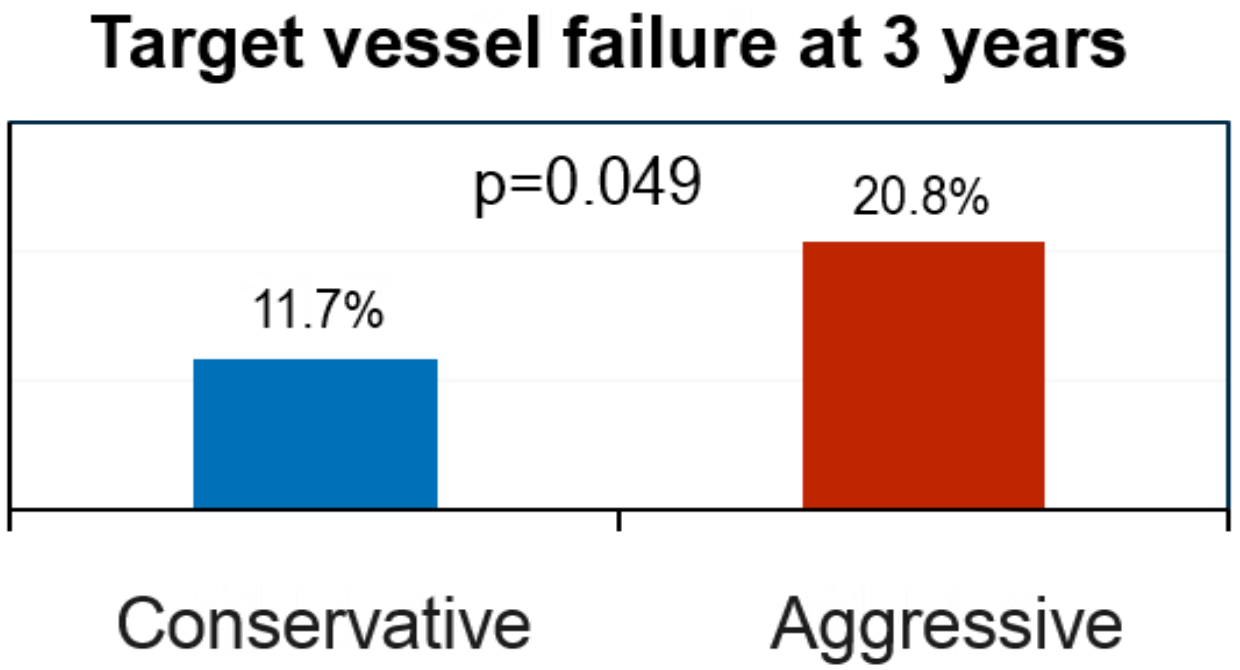
Lee JM, Koo BK, et al. Eurointervention 2015, SNUH registry and Nordic-Baltic bifurcation study

Higher Main Branch Restenosis Rate
In Routine Kissing Balloon Inflation

Restenosis Rate(%)	***Routine Kissing***	***Conservative Leave alone***	
Proxima Main Vessel	***7.5*** >	***0.9***	*P=0.018*
Distal Main Vessel	***7.5***	***2.8***	*P=0.50*
Side Branch	***2.9***	***5.6***	*P=0.11*

Kim YH, Park SJ, et al. JACC Interv. 2015 April 20;8(4):550-60, CROSS and PERFECT studies

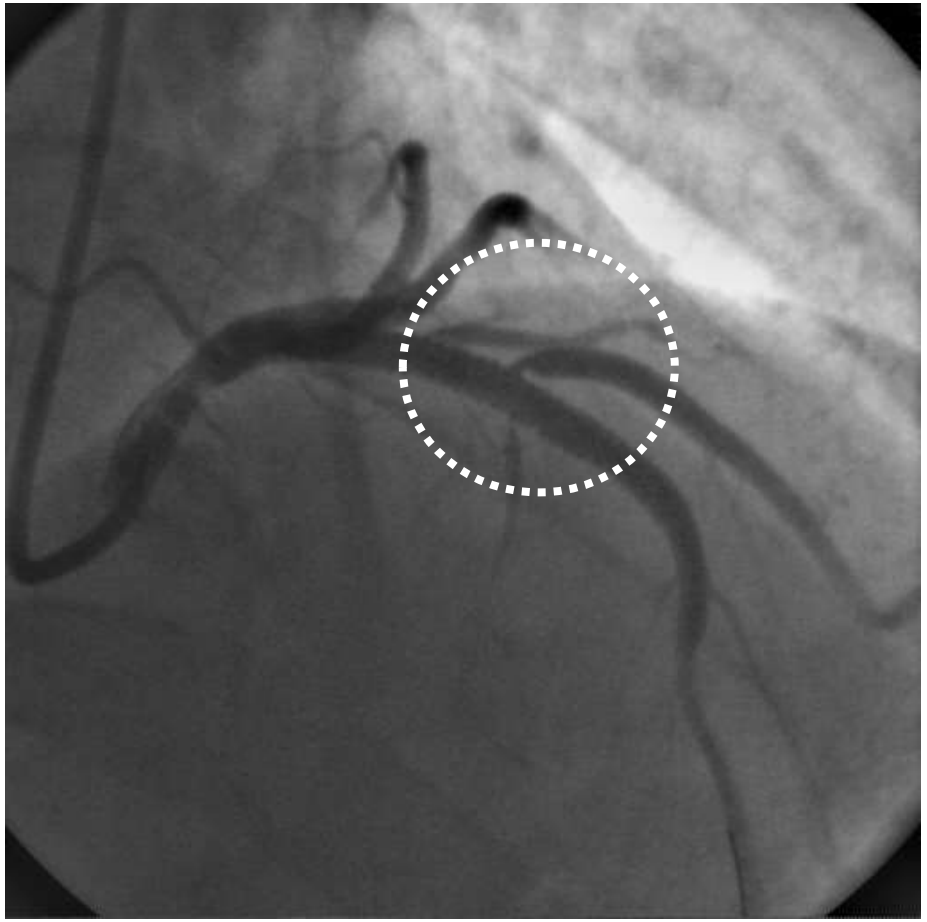
Higher Target Vessel Failure
In Aggressive Treatment of Side Brach



Gwon HC, et al. JACC interv 2016

M/65, Stable Angina,

LAD Cross Over, Big Side Branch Jailing, TIMI 3 Flow



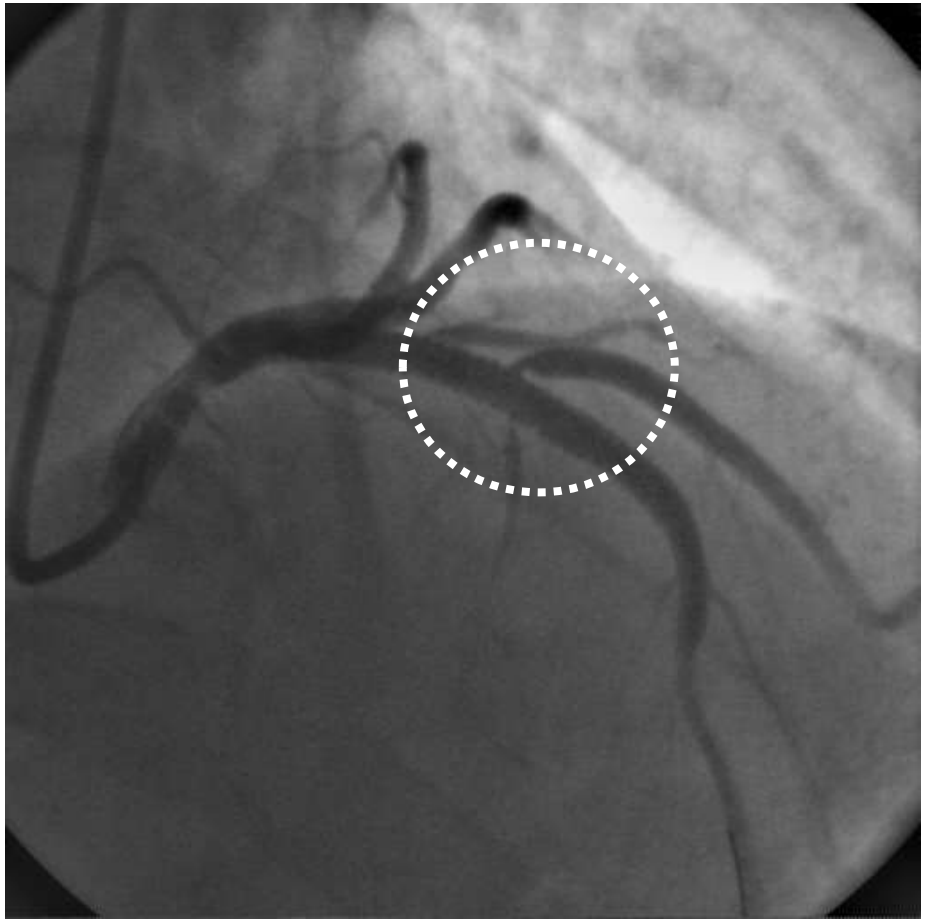
Why?

Leave It Alone !

1. FFR Would Be Negative (>70%).
2. Aggressive Treatment Paradoxically Increased TVF.
3. Medical Therapy Is Enough for Small Ischemic Burden.

M/65, Stable Angina,

Big Side Branch Jailing After LAD Crossover, TIMI 3 Flow



If Patient Has Chest Pain,

Provisional Balloon Angioplasty
With or without DEB or DES

My Basic Concept

for Non-LM Bifurcation PCI

Clinical Outcomes of Non-LM Bifurcation PCI Are Clearly Related with Main Branch Stenting Status.

My Simple Rule

for Non-LM Bifurcation PCI

Treat !

***Ischemic* Symptomatic,**

My Simple Rule

for Non-LM Bifurcation PCI

Treat !

Ischemic Symptomatic,

Large Side Branch (>2.5 mm),

Upfront 2 stents Would Be Good (<20%).

My Simple Rule

for Non-LM Bifurcation PCI

Leave It Alone !

Any Jailed Side Branch, Whatever Size
Would be, If No Symptoms,
Medical Therapy Is Enough !

My Simple Rule

for Any Bifurcation PCI

Concept Is More Important !

Than Technique for the Patients.