How Do I Know This Side Branch is Important?

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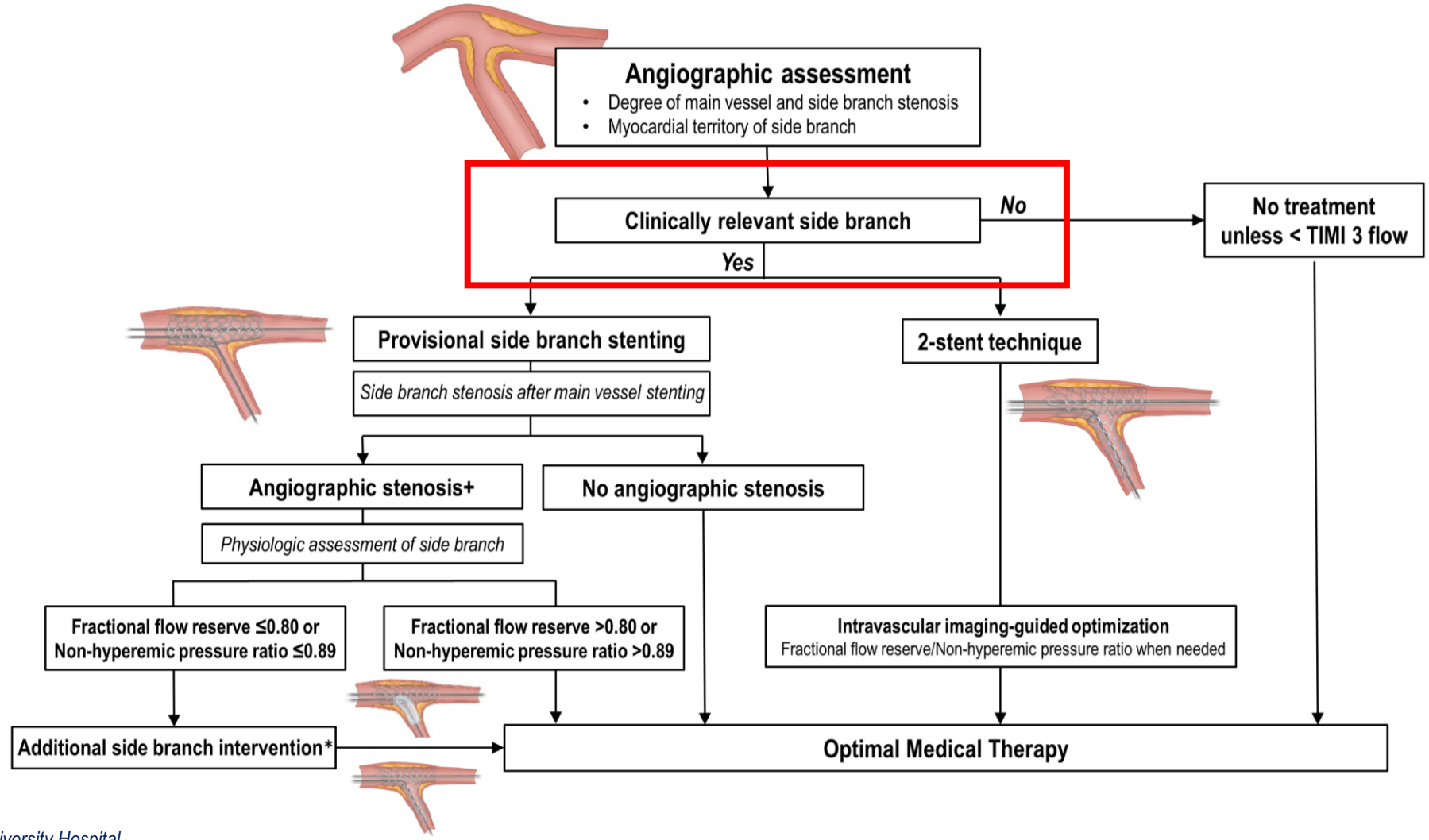
Disclosure Statement of Financial Interest

Within the past 12 months, I, [Bon-Kwon Koo] have had a financial interest/arrangement or affiliation with the organizations listed below:

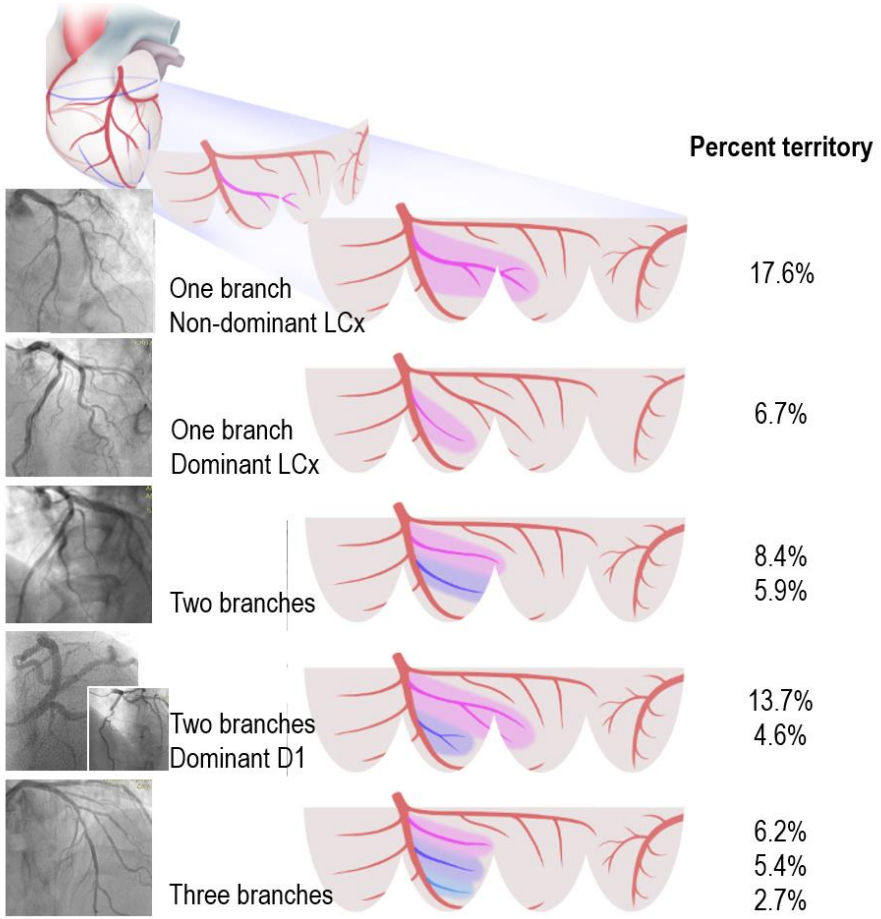
- Grant/Research Support: Institutional Research Grants from Abbott, Philips, and HeartFlow

Proposed algorithm for physiological approach

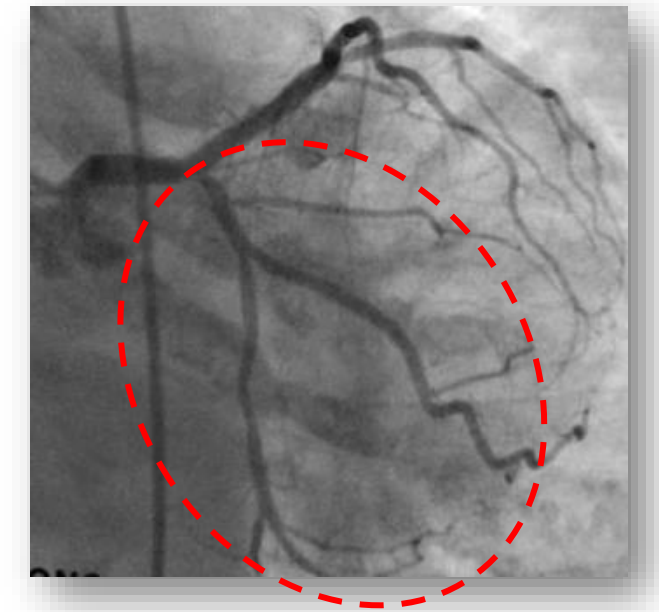
by Korean, Japanese, and European Bifurcation Clubs

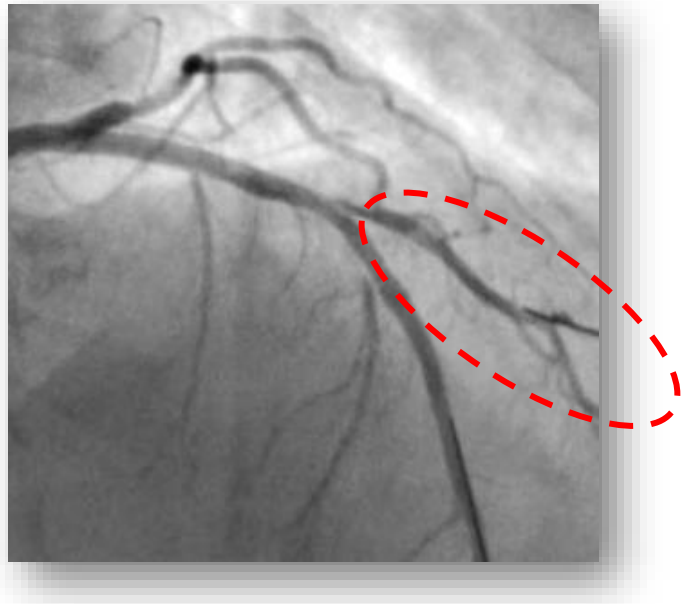


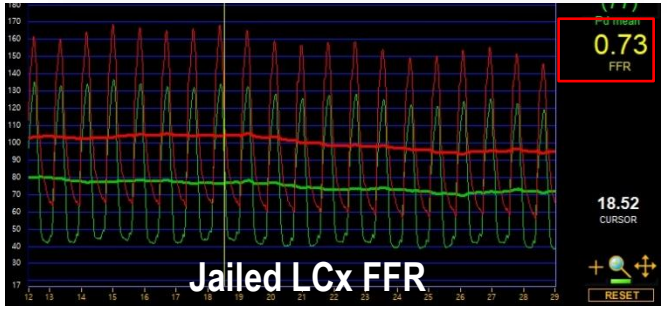
Clinical relevance is more important than physiological indexes!

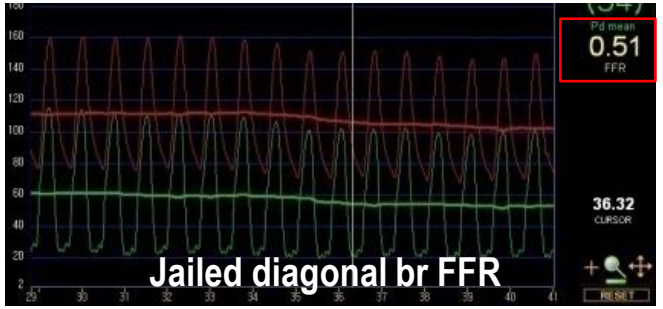


Jeon WK, Koo BK et al. Eurointervention 2020





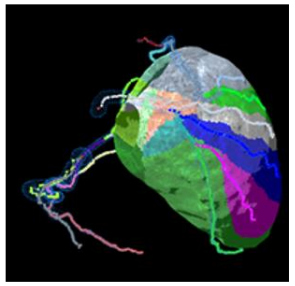




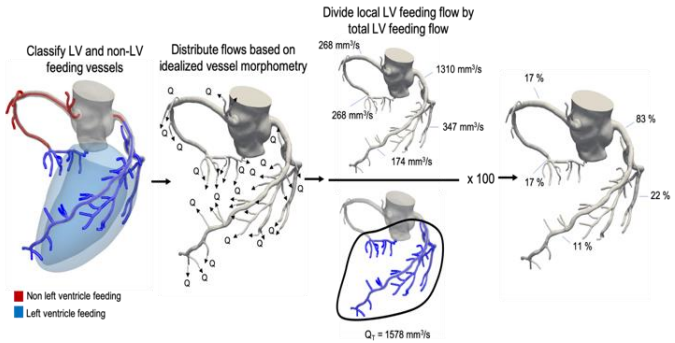
Identification of clinically relevant side branch

- **<u>Angiographic assessment</u>**
  - Reference vessel size
  - Visual estimation of myocardial territory
  - SNuH score
- Coronary CT angiography
- Myocardial perfusion imaging
- Cardiac MRI
- CT perfusion imaging, ……..

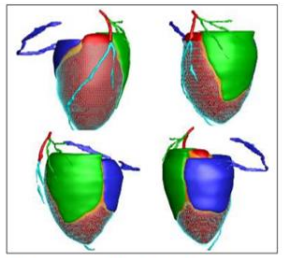
Fractional Myocardial Mass (FMM)



Myocardial Insights 1.0



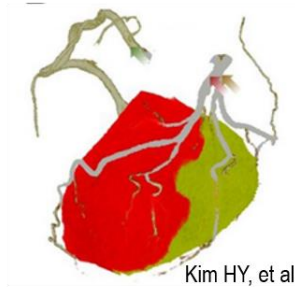
Coronary artery based myocardial segmentation (CAMS)



V_{sub}= 70cc, V_{ratio}= 47%

V_{sub}/MLA^2= 6.84 (> 4.04)

Myocardial mass at risk (MMAR)



Keulards D, et al. Heart 2020

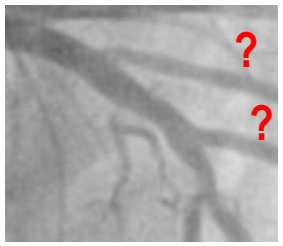
Kim HY, et al. JACC Cardiovasc Interv 2017

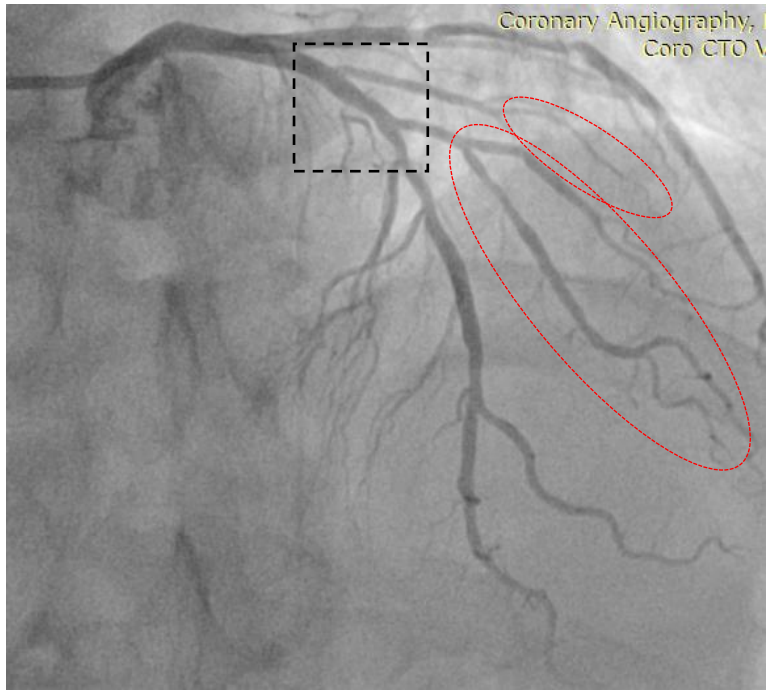
Kang SJ, t al. Am J Cardiol 2016

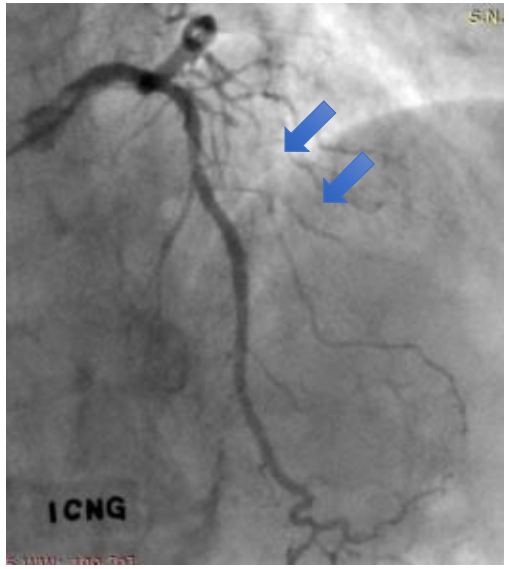
Sumitsuji, et al. Cardiovasc Interv and Ther 2015

Identification of clinically relevant side branch

- Limitations of angiographic assessment
  - Reference vessel size
    - Inter- and intra-individual variability
    - Not measurable in diffuse disease or total occlusion
    - Not accurate



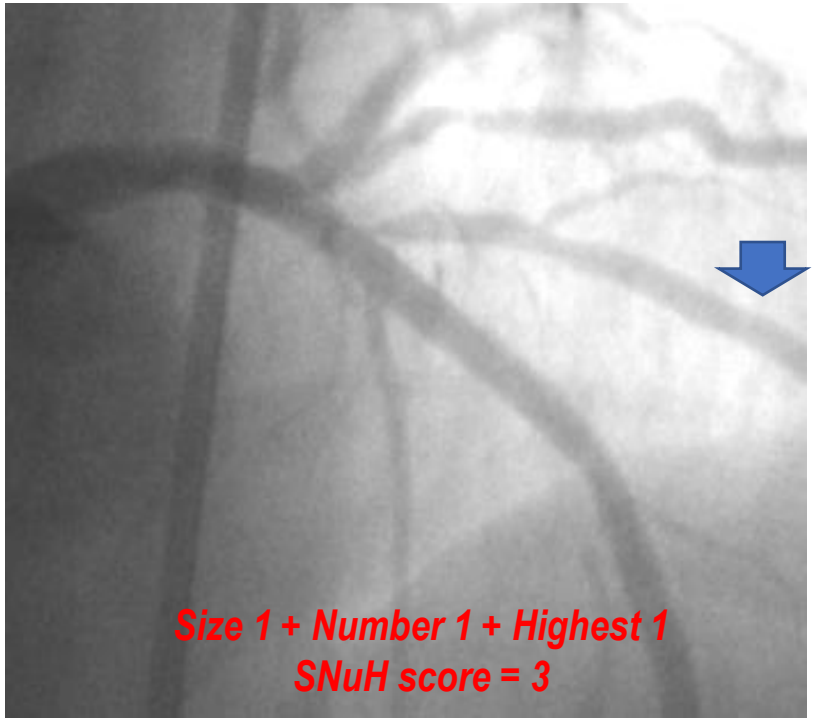


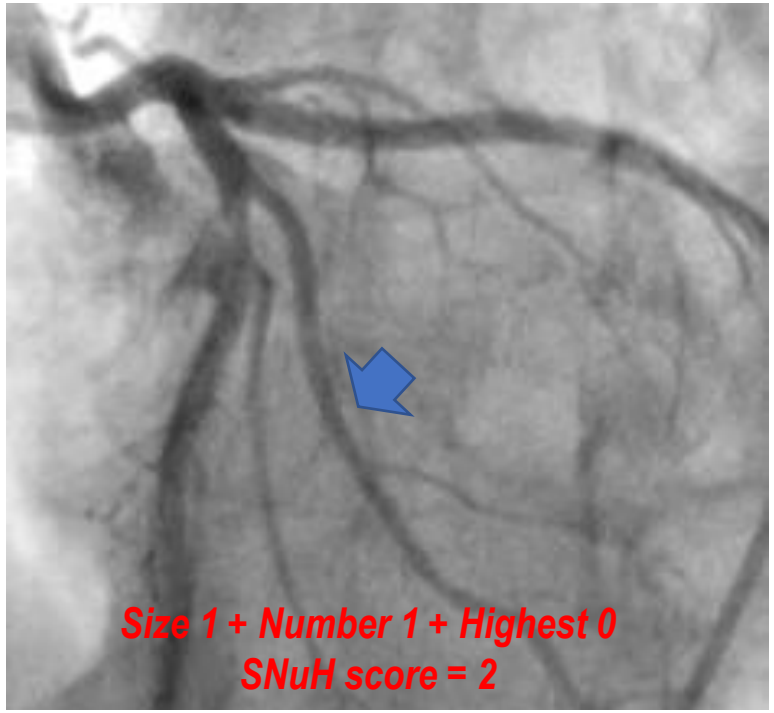


Scoring system for diagonal branches

- SNuH score -

Variables	Description	Score
Size (**S**)	Vessel diameter ≥ 2.5mm	1
Number (**Nu**)	Number of diagonal branches ≤ 2	1
Highest (**H**)	No branch below the target branch	1



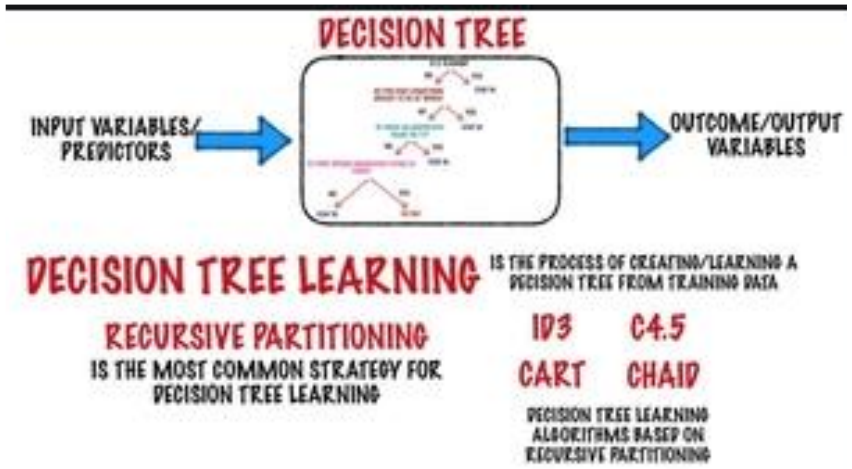


Koo BK, et al., JACC Intv 2012

Which diagonal branch is causing ST elevation with 1min balloon occlusion?

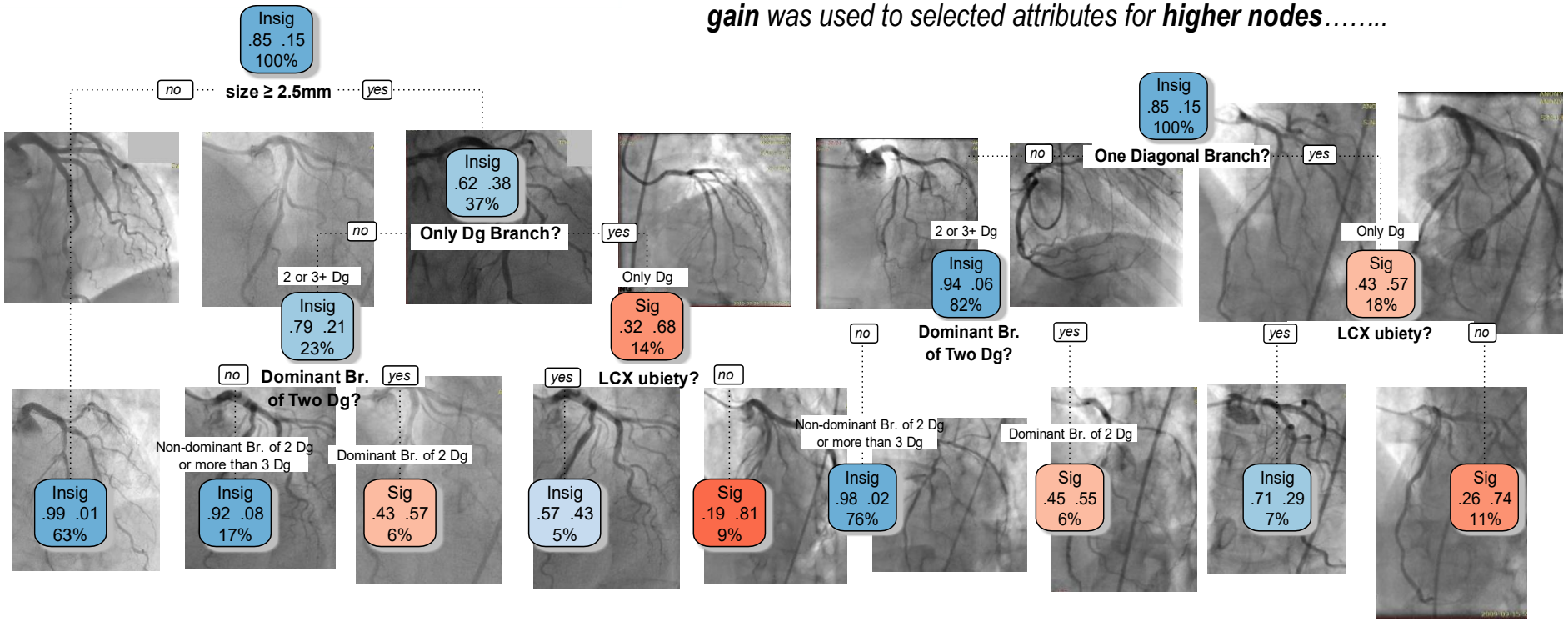
	ST elevation+	ST elevation-	P value
Patient characteristics	N=24	N=41	
Age, years	63.1±6.1	62.3±8.6	0.51
Diabetes Mellitus	9 (39%)	12 (29%)	0.42
LV ejection fraction, %	63.1±6.1	62.3±8.6	0.68
Angiographic characteristics			
% diameter stenosis	68.1±17.3	64.9±14.0	0.42
Lesion length, mm	15.3±10.7	11.4±8.3	0.10
Reference diameter, mm	2.4±0.3	2.3±0.4	0.12
SNuH score*	3 (2-3)	2 (1-3)	0.005

Koo BK, et al., JACC Intv 2012

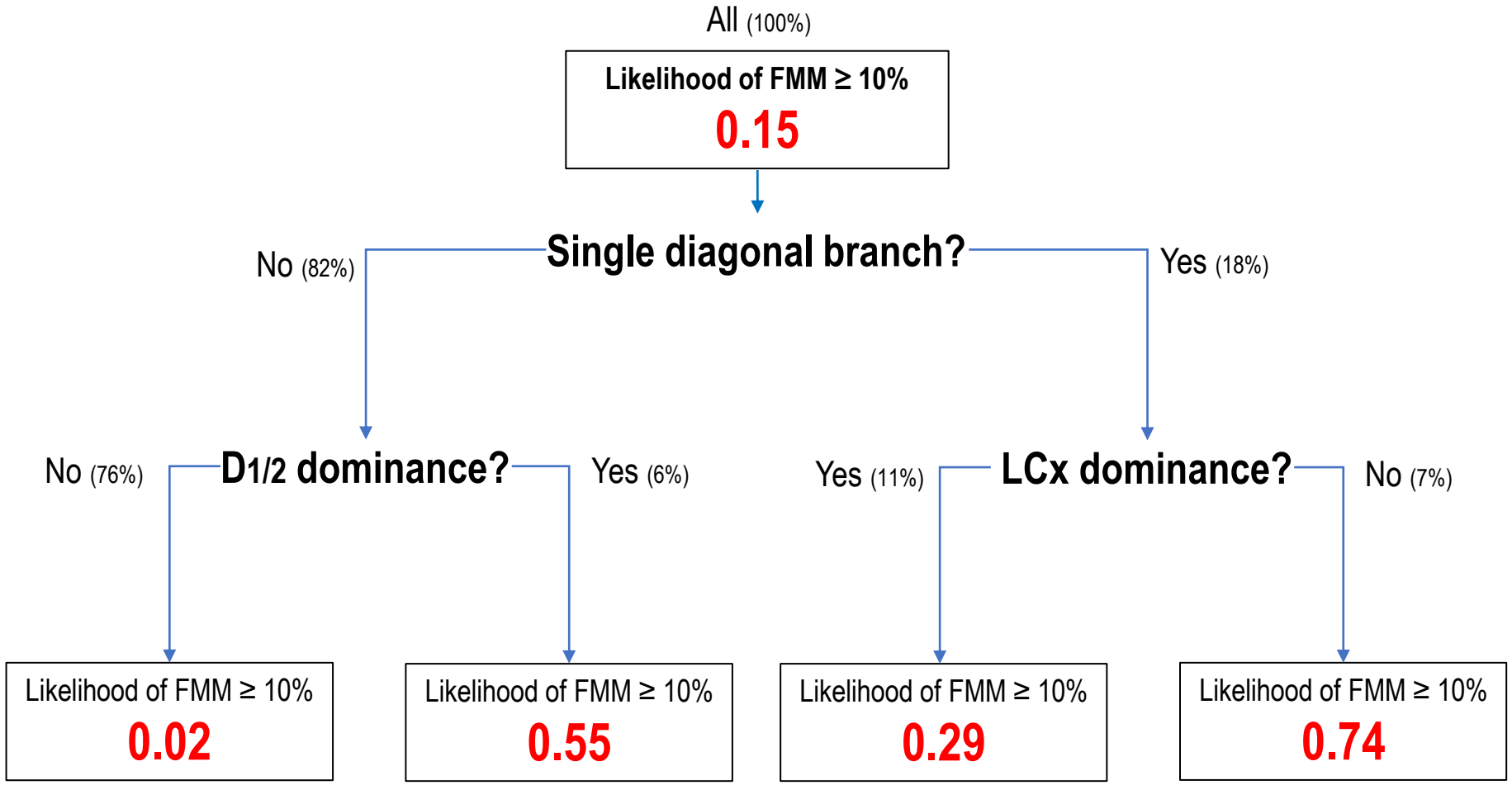


One branch? 2 branch? 3 branch? 2.8mm? 2.3mm? LCx dominance? D1/2 dominance? Non-dominant? ……..

…..To train and validate models to predict % FMM ≥ 10%, the entire CCTA dataset was split into training and validation sets (4:1). To build a decision tree model, the training and validation sets were used for ***recursive partitioning*** *with* ***10-fold cross-validation****.* ***Information gain*** *was used to selected attributes for* ***higher nodes****……..*



Decision Tree for Clinically Significant SB (>10%)



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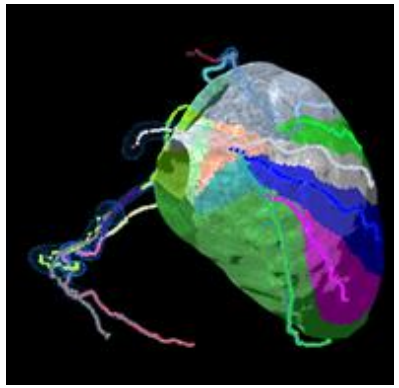
Significant SB?

- Anatomically
- Functionally (ischemic)
- **Clinically**
- **Prognostically**

Fractional Myocardial Mass (FMM)



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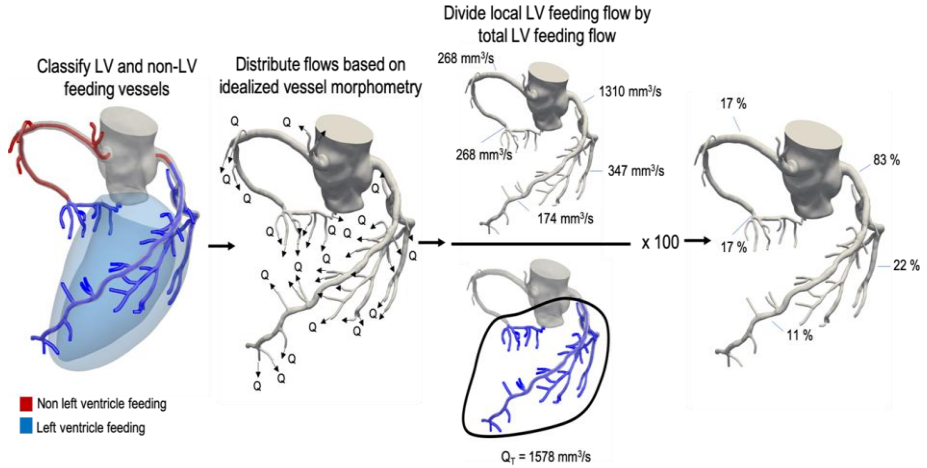
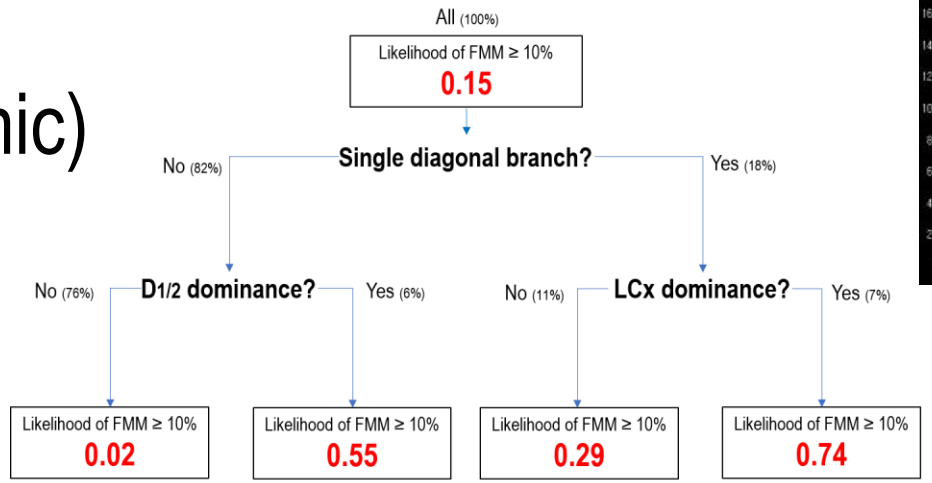
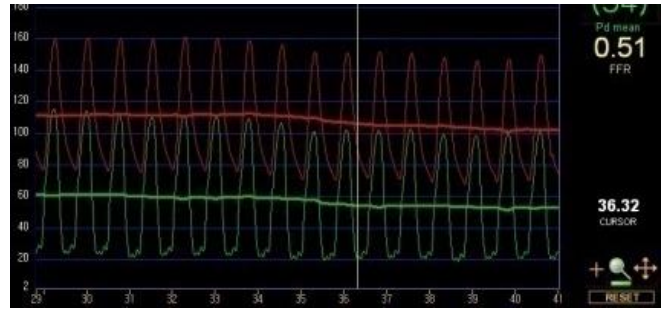
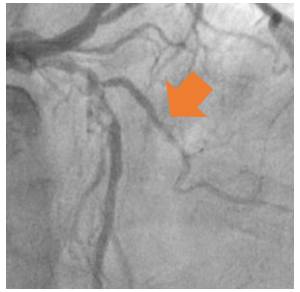






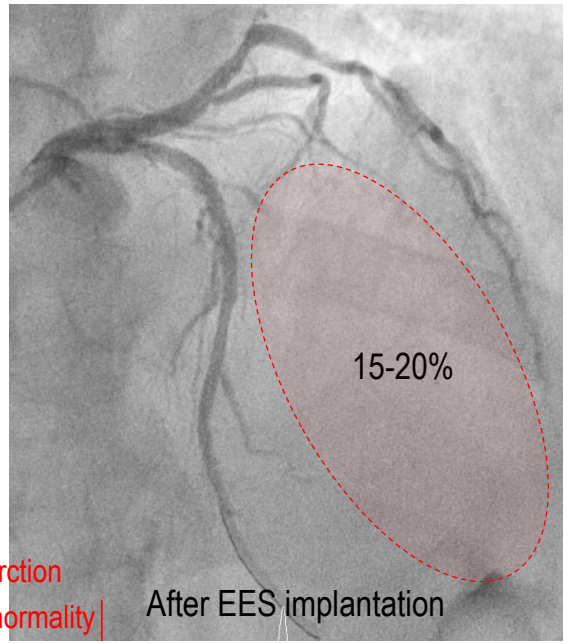
Anatomical territory = Clinical/Prognostic relevance?



Likelihood of FMM ≥ 10%

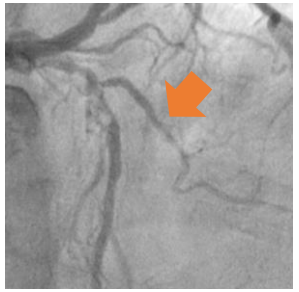
0.74

M/69 Stable angina



- Angina
- Myocardial ischemia/infarction
- Regional wall motion abnormality
- LV dysfunction
- Cardiac death

Anatomical territory ≠ Clinical/Prognostic relevance?



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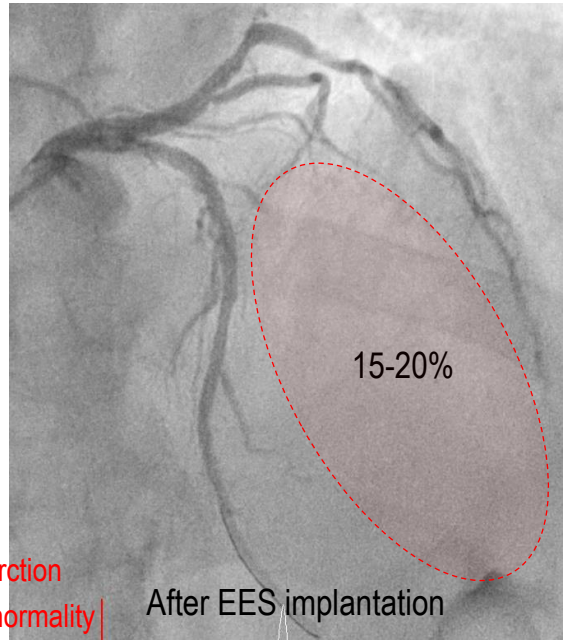

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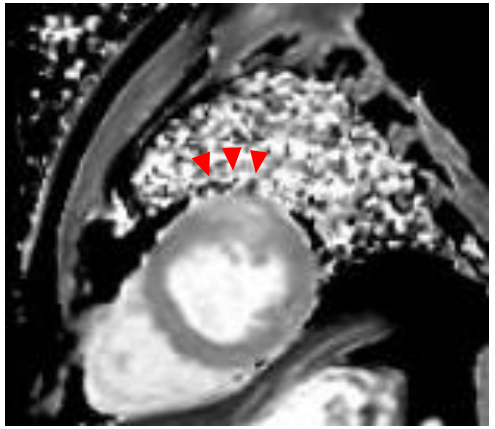
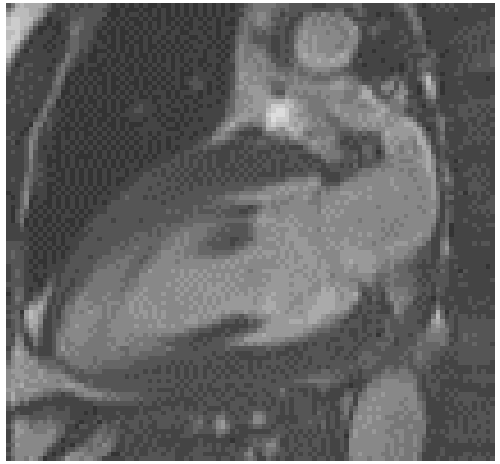
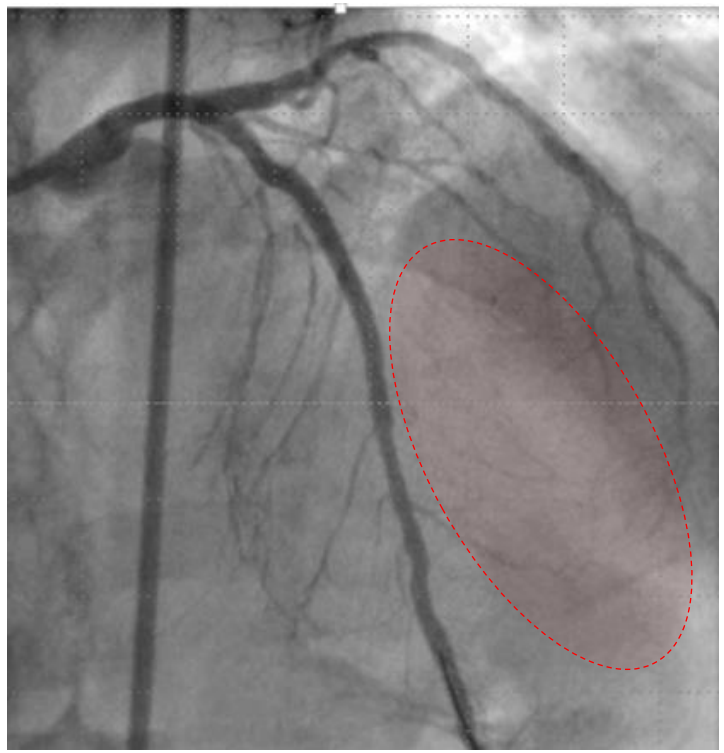
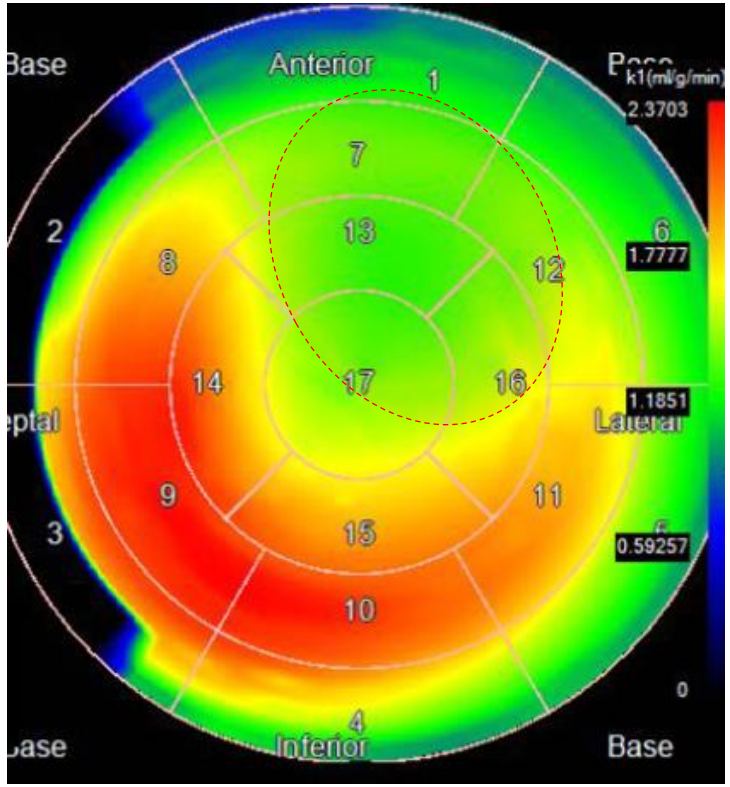


Stroke Volume:	74.55 ml
Ejection Fraction:	52.18%
Total Myocardial Mass	143.10 g
Total Enhanced Mass	10.51 g
Enhanced/Total mass	**7.30%**



ISCHEMIC territory ≠ Clinical/Prognostic relevance?

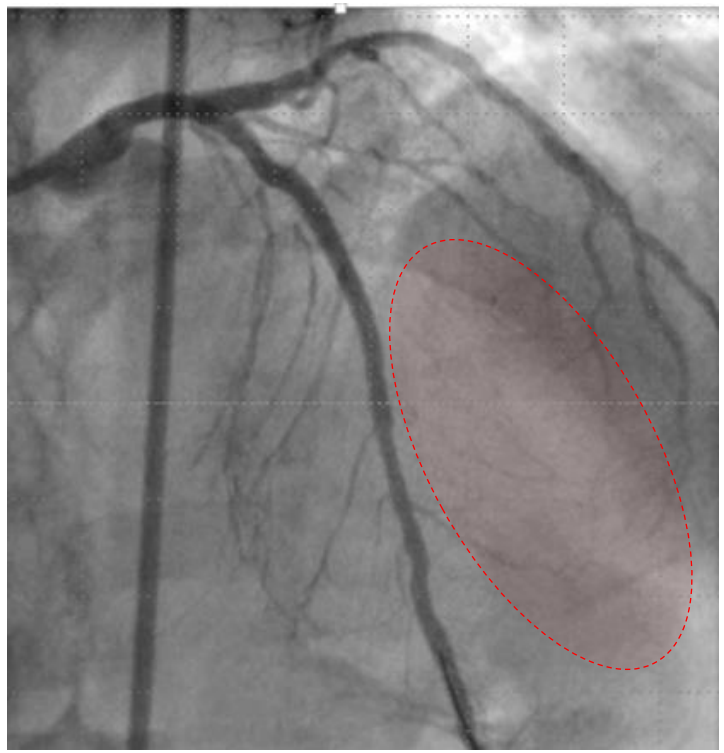


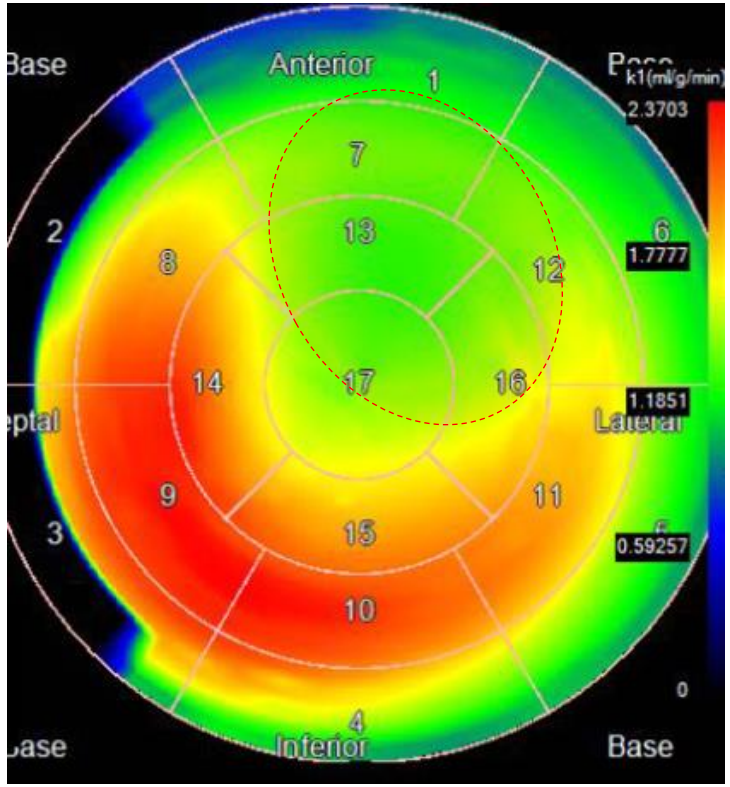


Ammonia PET

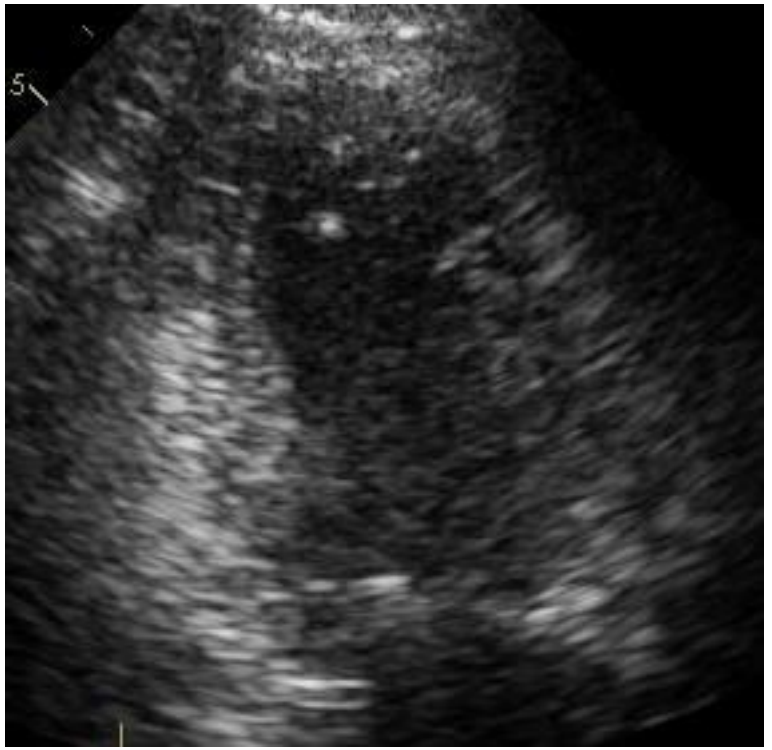
Exercise Echo

ISCHEMIC territory ≠ Clinical/Prognostic relevance?





Ammonia PET

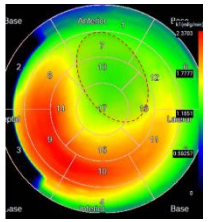


Exercise Echo

Anatomical/ISCHEMIC territory ≠ Clinical/Prognostic relevance?

Significant SB – Gaps in Domain Knowledge

Anatomical stenosis → Ischemia → Large territory (clinically relevant ischemia)

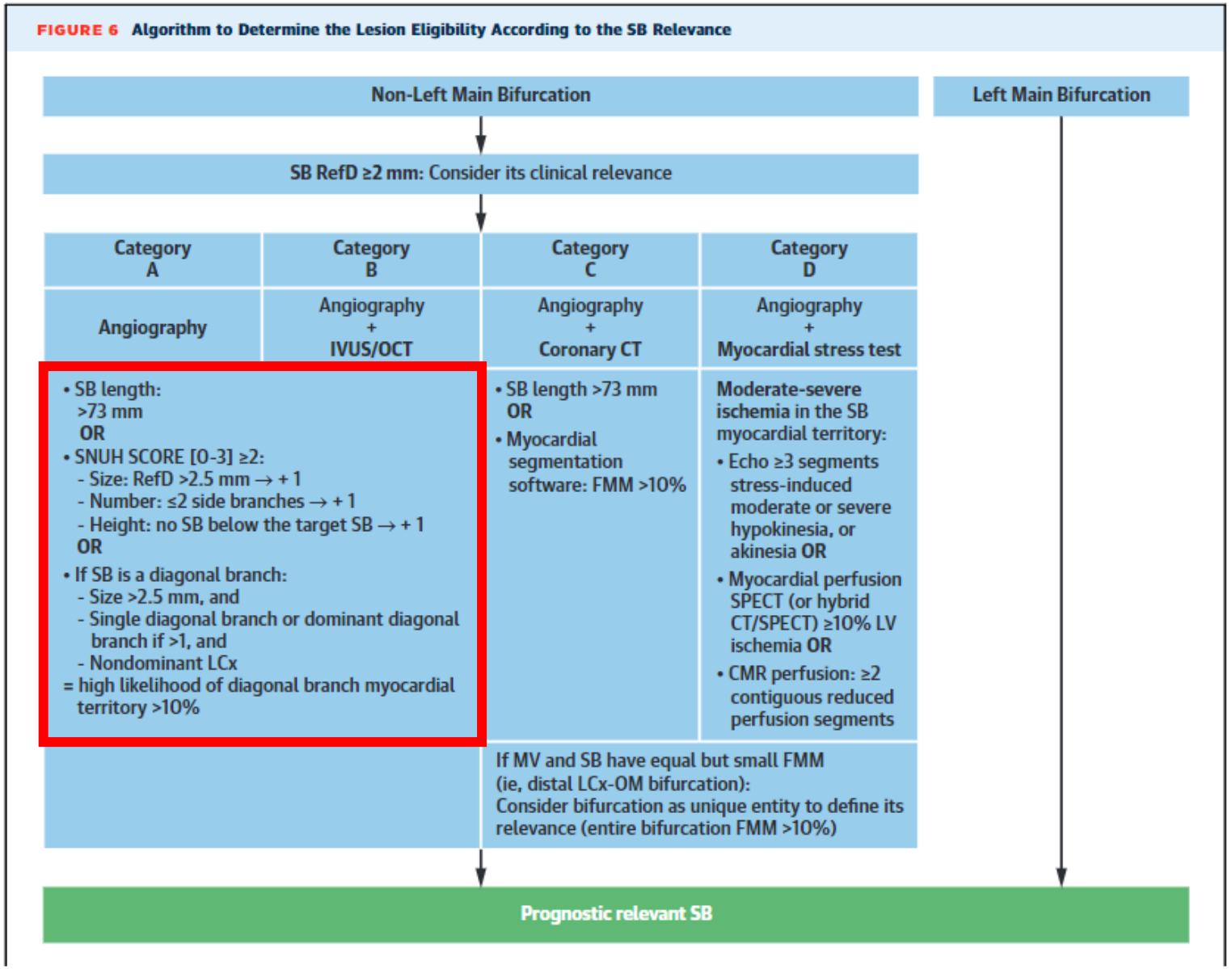


Angina
Arrhythmia
LV dysfunction
Cardiac death

Revascularization

Relief of ischemia
Improve symptom, LV dysfunction
Improve survival

Bif-ARC 2022



JACC 2022, Eurointervention 2022

Identification of clinically important side branch

- Identification of clinically important side branch should be the 1st evaluation step for bifurcation lesions.
- New tools and concepts can help operators to assess myocardial territory or ischemic burden.
- Further studies are still needed to define the clinically relevant branches that deserve stent implantation.
- Practically insight is that the territory of most side branches supply <10% of myocardial mass and cannot cause >10% ischemia. Therefore, don't do too much (physiologic assessment, imaging, PCI…..) for side branches.