

# TCTAP 2023

## Coronary CT angiography for Heart Team Decision-making in Multivessel Coronary Artery Disease

**Yoshinobu Onuma, MD, PhD**

**Professor in Interventional Cardiology at University of Galway, Medical Director  
CORRIB Corelab research centre for coronary imaging and Atherosclerosis research**

**Nozomi Kotoku, MD**

**Patrick W. Serruys, MD, PhD**

Sunday, May 7

4:36 pm-4:43 pm

Presentation Theater 1, Vista 3, B2

# Disclosure

- Nothing to declare

# Guideline Recommendations for Coronary CTA

**NICE** National Institute for Health and Care Excellence  
Clinical guideline  
Published: 24 March 2010  
[nice.org.uk/guidance/ce95](http://nice.org.uk/guidance/ce95)

**guideline**

**Chest pain of recent onset: assessment and diagnosis**

**Recommend CTA as first-line test**

**Using CTA with FFR<sub>CT</sub> may lead to cost savings of £214 per patient avoiding invasive investigation and treatment (13 Feb 2017).**

*Projection...* ↑  
**CTA 400%**  
**Invasive angiography 60%** ↓

**Should NICE guidelines be universally accepted for the evaluation of stable coronary disease? A debate**

Harvey S. Hecht<sup>1\*</sup>, Leslee Shaw<sup>2</sup>, Y.S. Chandrashekar<sup>3</sup>, Jeroen J. Bax<sup>4</sup>, and Jagat Narula<sup>1</sup>

NICE Guideline: The Scales of CTA Evidence

PRO: Highest sensitivity, Better prognosticator, Improves outcomes & medical Rx

CON: Lower specificity, functional component, Less availability

**Balanced**

Go to the Best available technology & expertise  
Stenosis + Risk + Ischemia

+ FFR<sub>CT</sub>  
+ High risk plaque

**In favor of CTA as driven by NICE guidelines**

Eur Heart J. 2019 May 7;40(18):1440-1453.

**2019 ESC Guidelines for the diagnosis and management of chronic coronary syndromes**

The Task Force for the diagnosis and management of chronic coronary syndromes of the European Society of Cardiology (ESC)

**Class I Level B recommendation**

**Coronary CTA with Non-invasive functional imaging** recommended as **the initial test to diagnose CAD** in symptomatic patients in whom obstructive CAD cannot be excluded by clinical assessment alone.

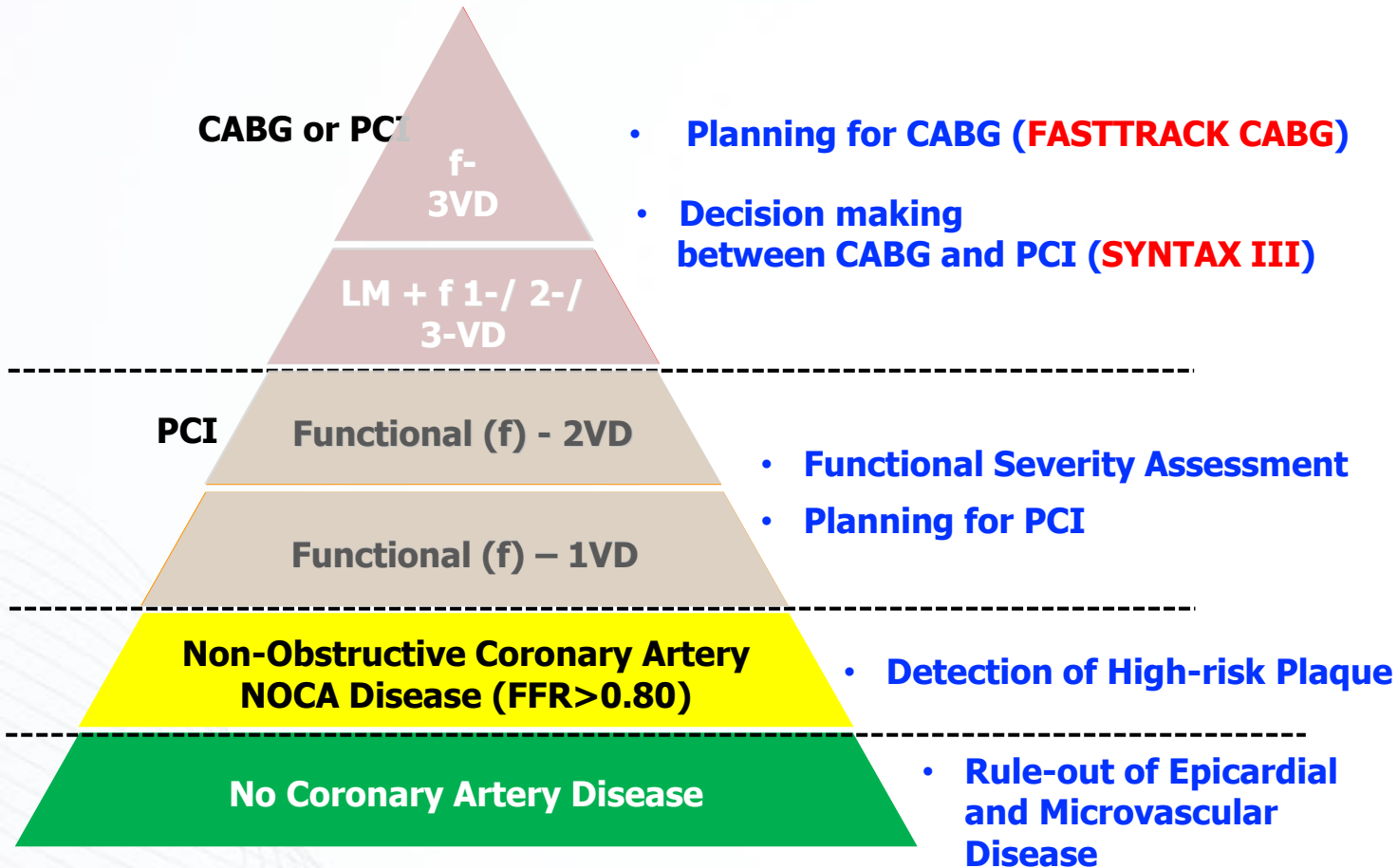
Knuuti J, Wijns W, et al. Eur Heart J. 2019 Aug 31. pii: ehz425.

**2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guideline for the Evaluation and Diagnosis of Chest Pain**

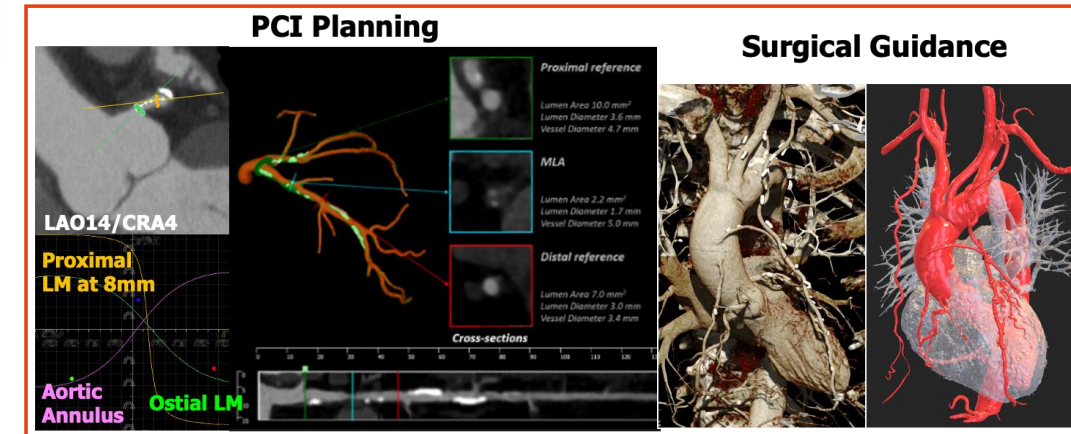
**1** **A**

For intermediate-risk patients with acute chest pain and no known CAD eligible for diagnostic testing after a negative or inconclusive evaluation for ACS, **CCTA is useful for exclusion of atherosclerotic plaque and obstructive CAD**

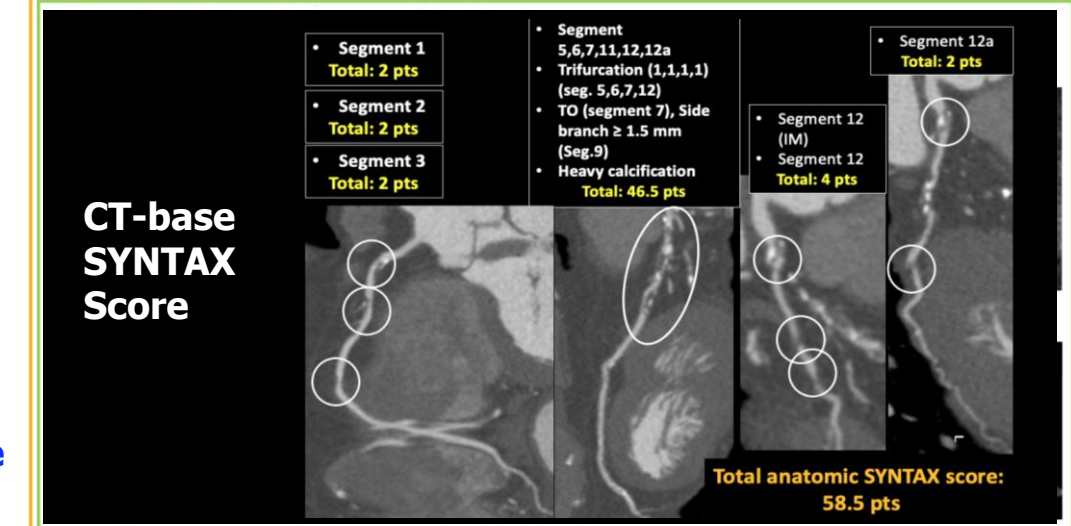
# The role of CCTA in CAD: a diagnostic tool, decision maker and treatment planner



## Treatment Planner



## Decision Maker



Serruys et.al. JACC State-of-the-Art Review CCTA vol.78:713-736.

Serruys et al. State-of-the-art EuroIntervention 2023;18(16):e1307-e1327.

# Recommendation for the revascularization mode in patients with multivessel disease

## ESC Guideline 2018

Neumann FJ et al. Eur Heart J. 2019 Jan 7;40(2):87-165.

### Pts without DM

Extent of CAD	CABG		PCI	
3VD with low SS (0-22)	I	A	I	A
3VD with intermediate or high SS (>22)	I	A	III	A

### Pts with DM

Extent of CAD	CABG		PCI	
3VD with low SS (0-22)	I	A	IIb	A
3VD with intermediate or high SS (>22)	I	A	III	A

## ACC/AHA/SCAI Guideline 2021

Jennifer S. Lawton et al. Circulation. 2021;144:00-00.

### Recommendations for Revascularization to Improve Survival in SIHD Compared With Medical Therapy

	CABG		PCI	
Left ventricular dysfunction and multivessel CAD	I		B-R	
Multivessel CAD	IIb		IIb	
	In patients with SIHD, normal ejection fraction, significant stenosis in 3 major coronary arteries, and anatomy suitable for CABG, CABG may be reasonable to improve survival.		In patients with SIHD, normal ejection fraction, significant stenosis in 3 major coronary arteries, and anatomy suitable for PCI, the usefulness of PCI to improve survival is uncertain.	

# Recommendation for the revascularization mode in patients with left main disease

## ESC Guideline 2018

*Neumann FJ et al. Eur Heart J. 2019 Jan 7;40(2):87-165.*

Extent of CAD	CABG		PCI	
Left main disease with low SS (0-22)	I	A	I	A
Left main disease with intermediate SS (23-32)	I	A	IIa	A
Left main disease with high SS ( $\geq 33$ )	I	A	III	B

## ACC/AHA/SCAI Guideline 2021

*Jennifer S. Lawton et al. Circulation. 2021;144:00-00.*

### Recommendations for Revascularization to Improve Survival in SIHD Compared With Medical Therapy

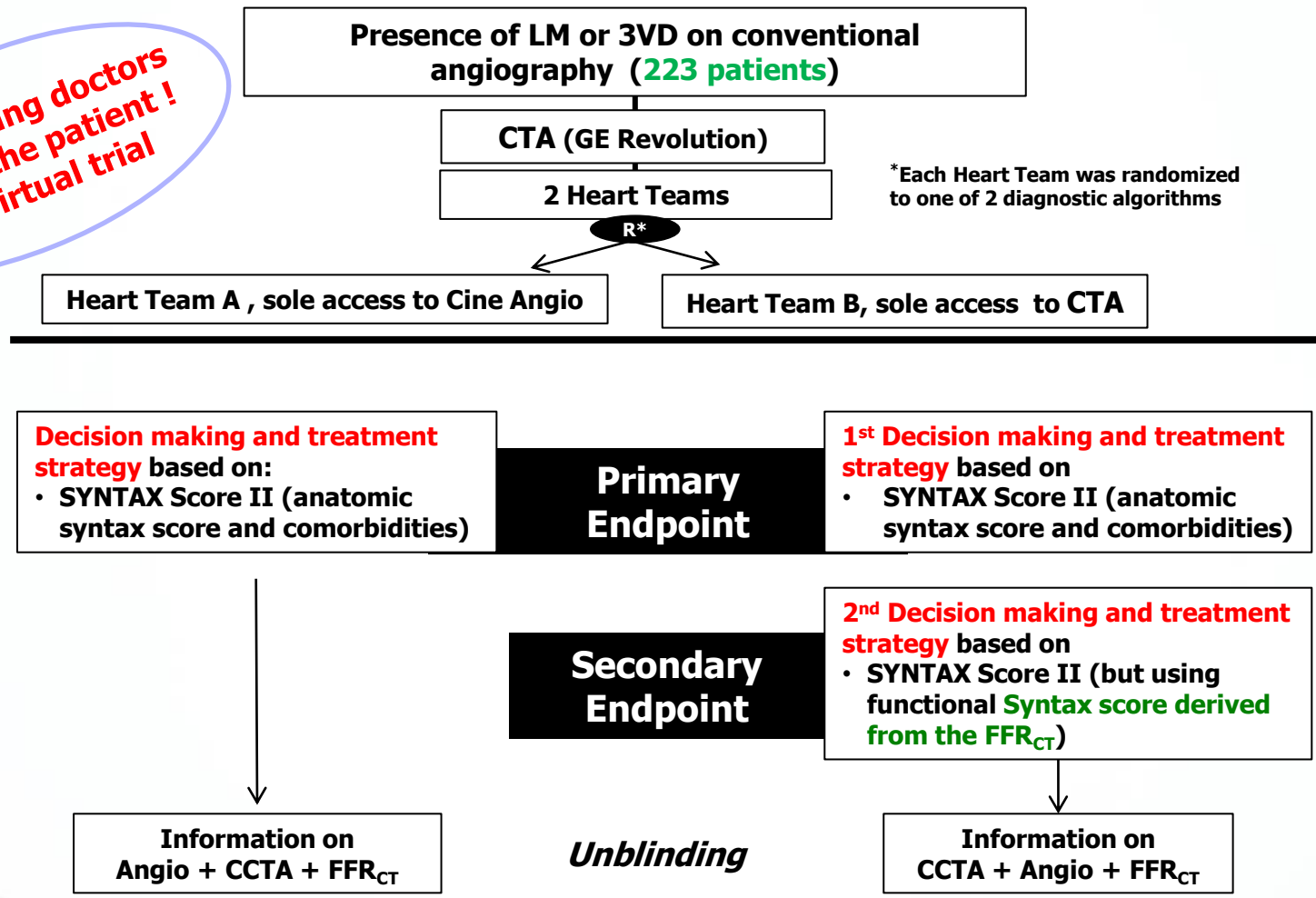
	CABG		PCI	
Left main CAD	I	B-R	IIa	B-NR
	In patients with SIHD and significant left main stenosis, CABG is recommended to improve survival.		In selected patients with SIHD and significant LM stenosis for whom PCI can provide equivalent revascularization compared with CABG, PCI is reasonable to improve survival.	

# Coronary computed tomography angiography for heart team decision-making in multivessel coronary artery disease

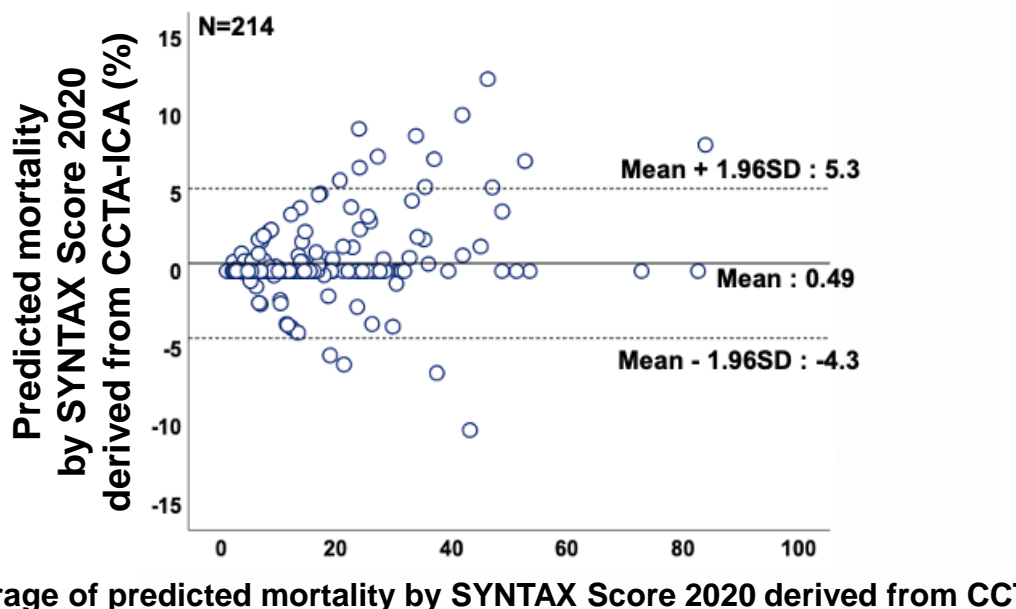
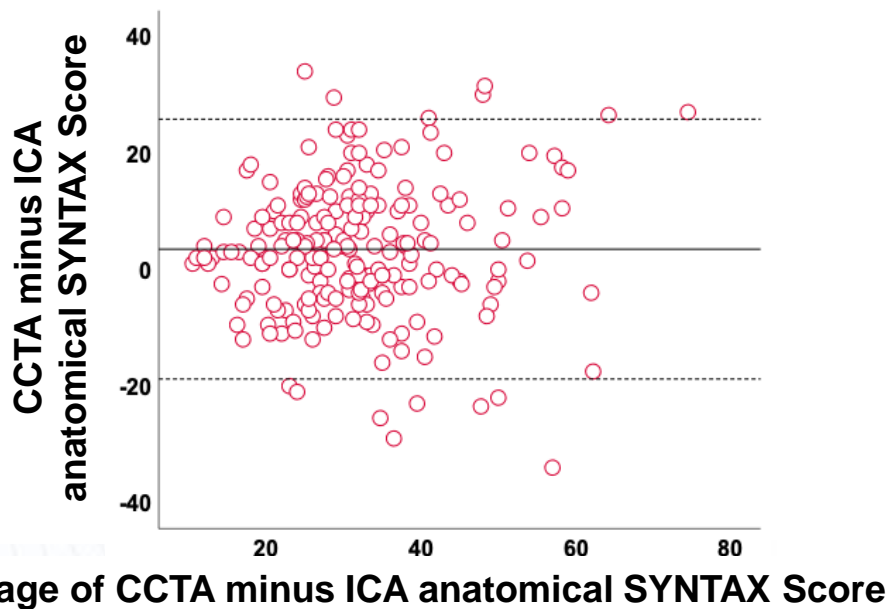
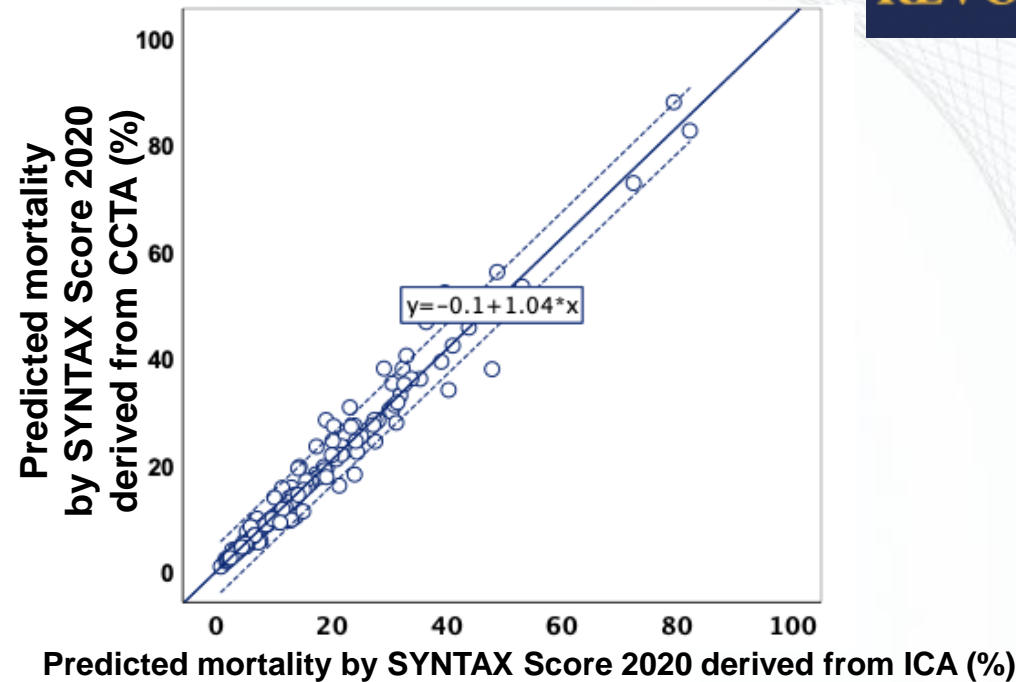
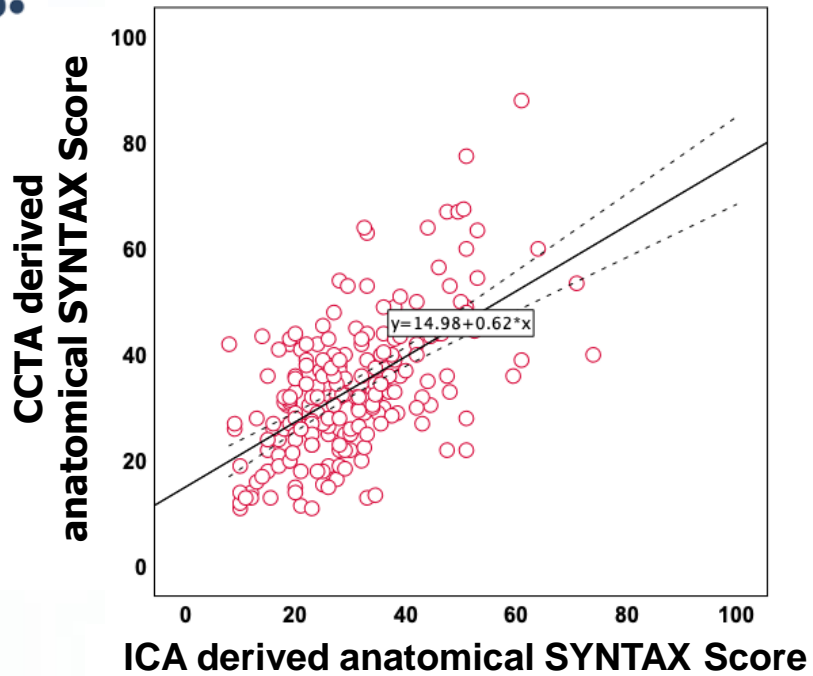
**Carlos Collet<sup>1,2†</sup>, Yoshinobu Onuma<sup>3,4†</sup>, Daniele Andreini<sup>5</sup>, Jeroen Sonck<sup>2</sup>, Giulio Pompilio<sup>5</sup>, Saima Mushtaq<sup>5</sup>, Mark La Meir<sup>6</sup>, Yosuke Miyazaki<sup>3</sup>, Johan de Mey<sup>7</sup>, Oliver Gaemperli<sup>6</sup>, Ahmed Ouda<sup>8</sup>, Juan Pablo Maureira<sup>9</sup>, Damien Mandry<sup>10</sup>, Edoardo Camenzind<sup>11</sup>, Laurent Macron<sup>12</sup>, Torsten Doenst<sup>13</sup>, Ulf Teichgräber<sup>14</sup>, Holger Sigusch<sup>15</sup>, Taku Asano<sup>1</sup>, Yuki Katagiri<sup>1</sup>, Marie-angele Morel<sup>3</sup>, Wietze Lindeboom<sup>4</sup>, Gianluca Pontone<sup>5</sup>, Thomas F. Lüscher<sup>8,16</sup>, Antonio L. Bartorelli<sup>5,17\*</sup>, and Patrick W. Serruys<sup>16\*</sup>;**  
for the SYNTAX III REVOLUTION investigators

# CCTA combined with FFR<sub>CT</sub> for Heart Team Decision-making in Multivessel Coronary Disease

*Randomizing doctors and not the patient!  
In a virtual trial*







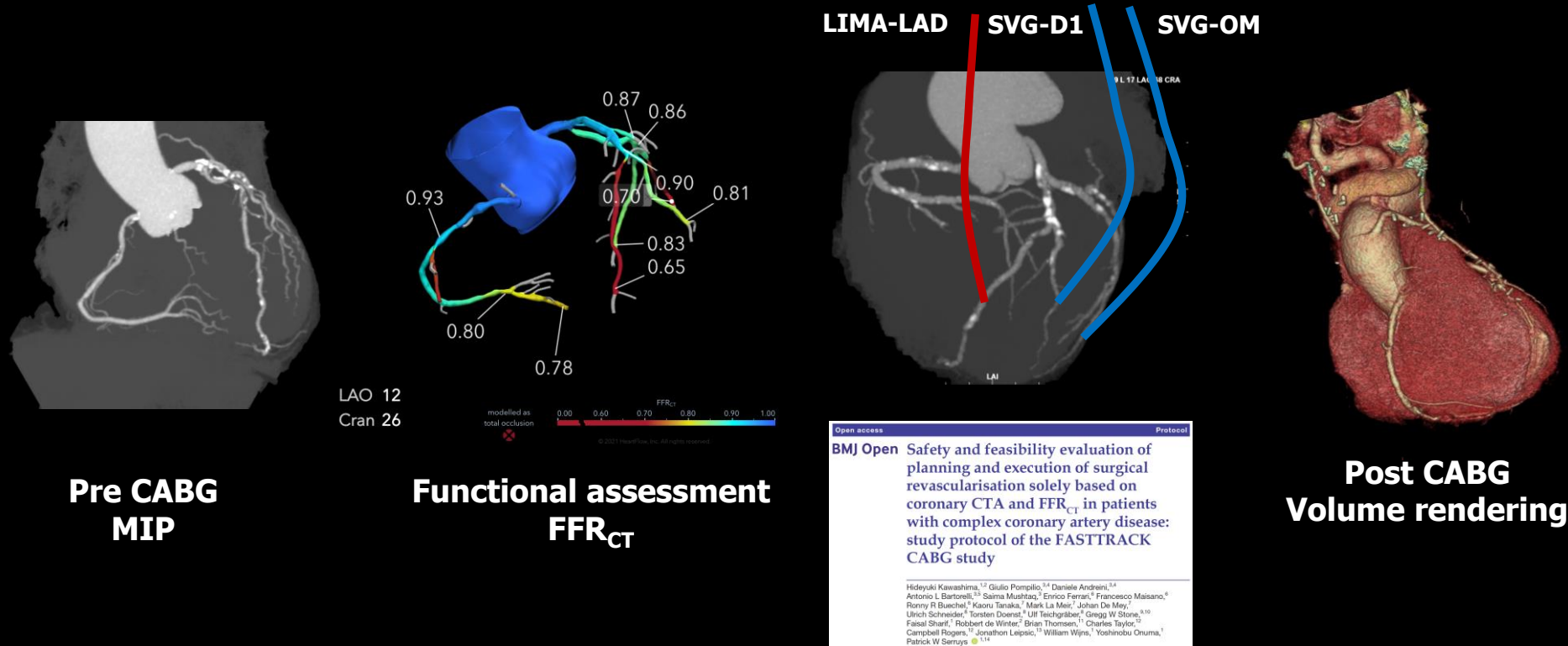
	Heart team treatment recommendation based on coronary computed tomography angiography		
Heart team treatment recommendation based on conventional angiography	CABG	PCI/Equipoise CABG and PCI	
CABG	23.4% (52/222)	2.7% (6/222)	26.1% (58/222)
PCI/Equipoise CABG and PCI	4.5% (10/222)	69.4% (154/222)	73.9% (164/222)
	27.9% (62/222)	72.1 (160/222)	92.8%(206/222)
<b>Cohen's kappa 0.82 (95% CI 0.73 to 0.91)</b>			

- The heart team **changed the treatment recommendation in 7%** of the cases and modified the selection of **vessel to be revascularization in 12%** when **functional evaluation with FFR<sub>CT</sub>** was added to an anatomical assessment with CCTA.

- **SYNYAX III demonstrated that CT could be used for decision-making of the selection of revascularization mode between CABG or PCI.**
- **The question remains whether surgeons can operate CABG solely based on CCTA?**

# FASTTRACK CABG Trial

CABG plan in "CCTA Planning  
and Operating Heart Team"



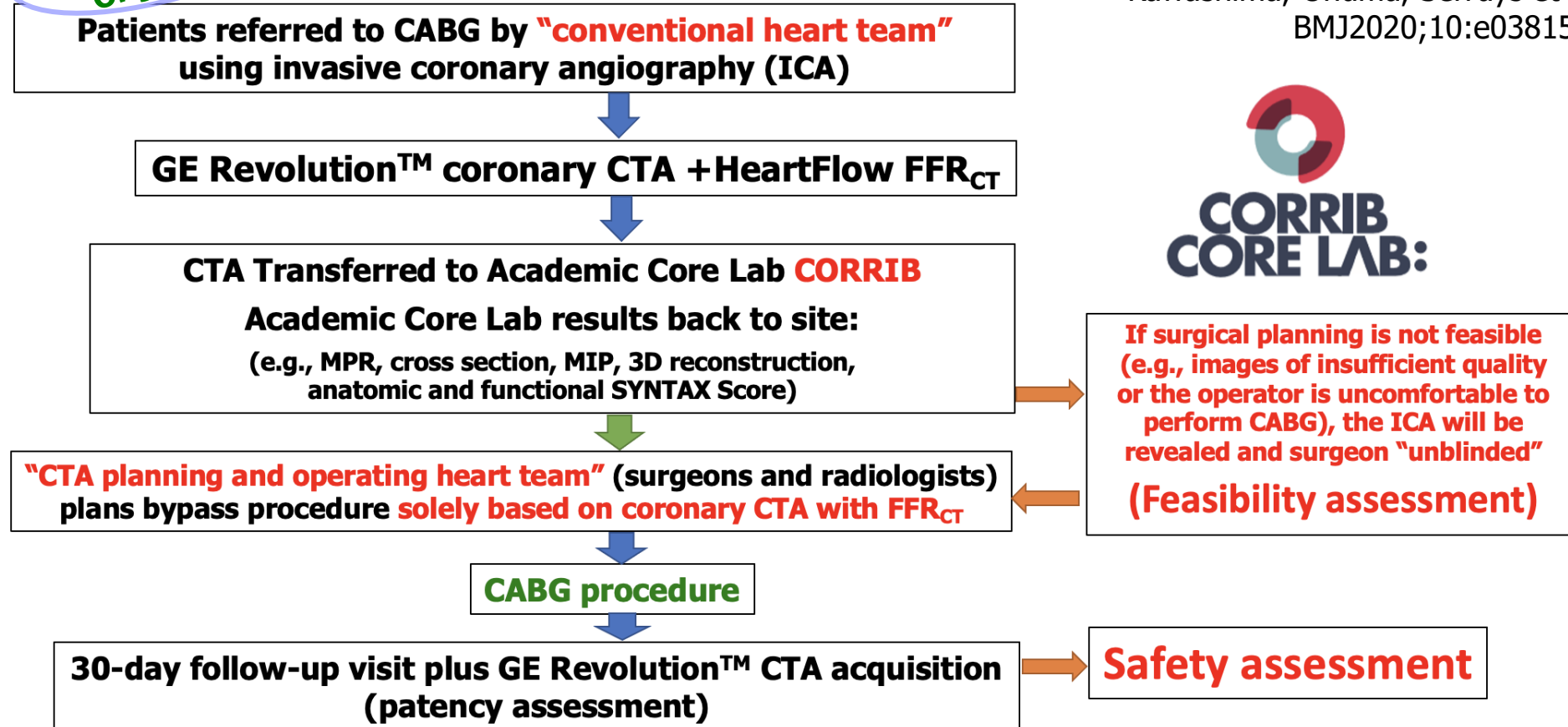
The FASTTRACK CABG study evaluates the **feasibility and safety of planning and execution of CABG solely based on CCTA combined with FFR<sub>CT</sub>** without knowledge of the anatomy defined by invasive coronary angiography. At 30 days after CABG, postsurgical CCTA is performed to evaluate the patency of bypass grafts.

# CABG Planning solely based on CCTA combined with FFR<sub>CT</sub>

The real thing  
has started!  
Ongoing trial

## FASTTRACK CABG trial

Kawashima, Onuma, Serruys et al.  
BMJ2020;10:e038152.

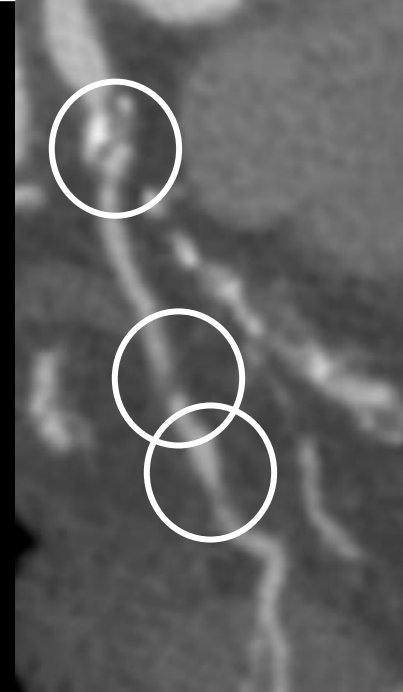
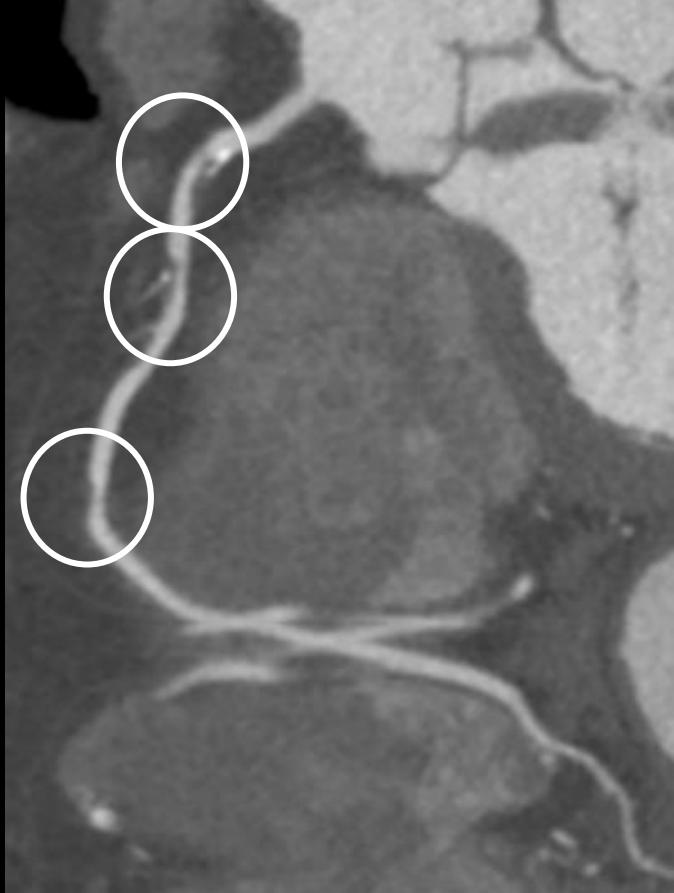


- Segment 1  
**Total: 2 pts**
- Segment 2  
**Total: 2 pts**
- Segment 3  
**Total: 2 pts**

- Segment 5,6,7,11,12,12a
- Trifurcation (1,1,1,1) (seg. 5,6,7,12)
- TO (segment 7), Side branch  $\geq 1.5$  mm (Seg.9)
- Heavy calcification  
**Total: 46.5 pts**

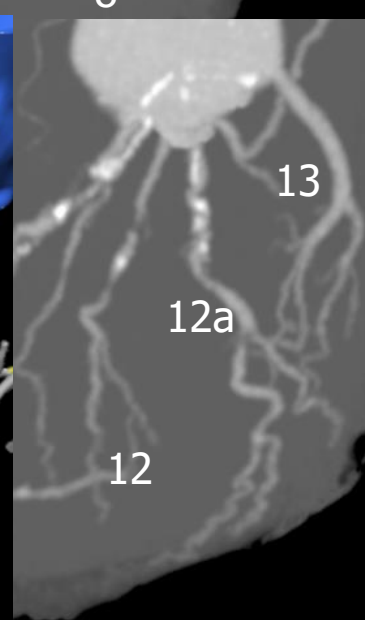
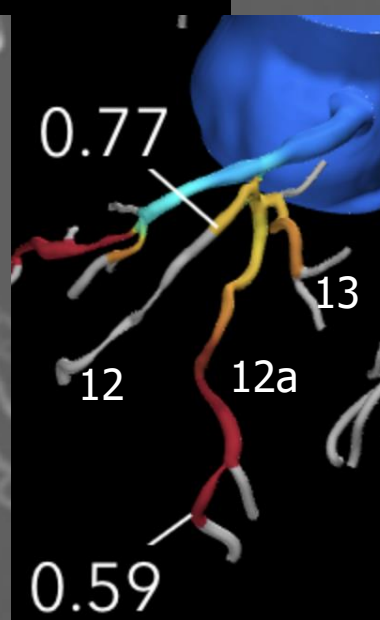
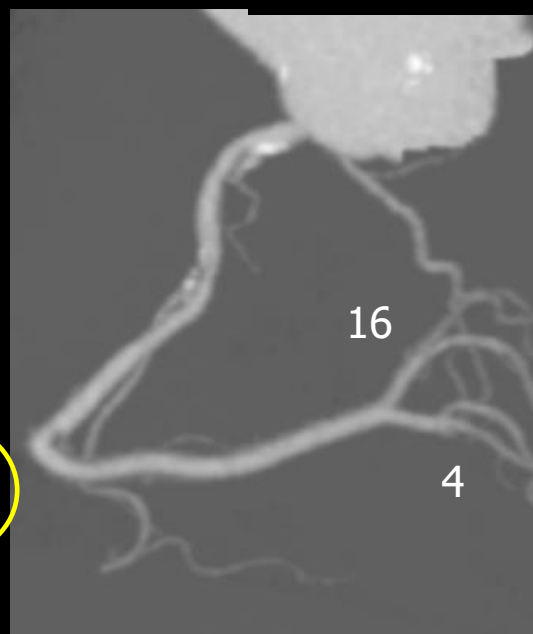
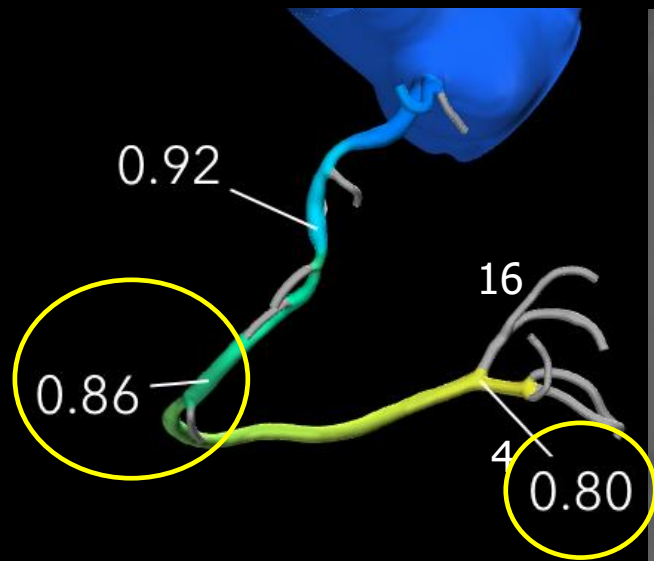
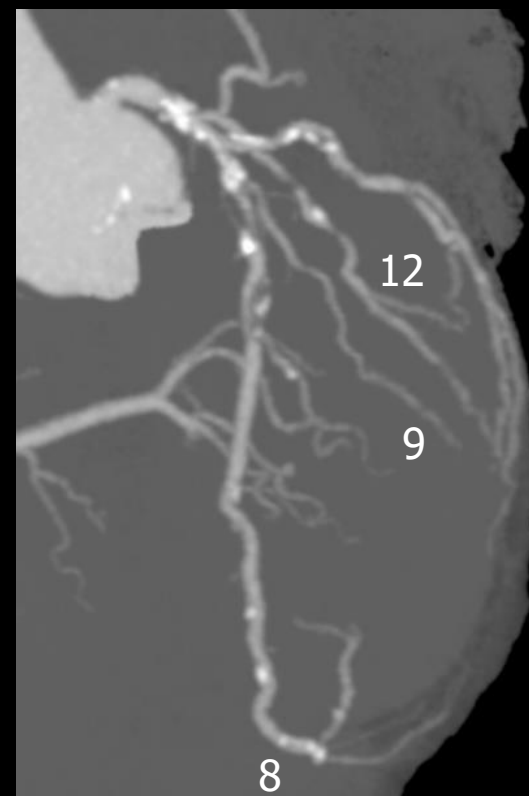
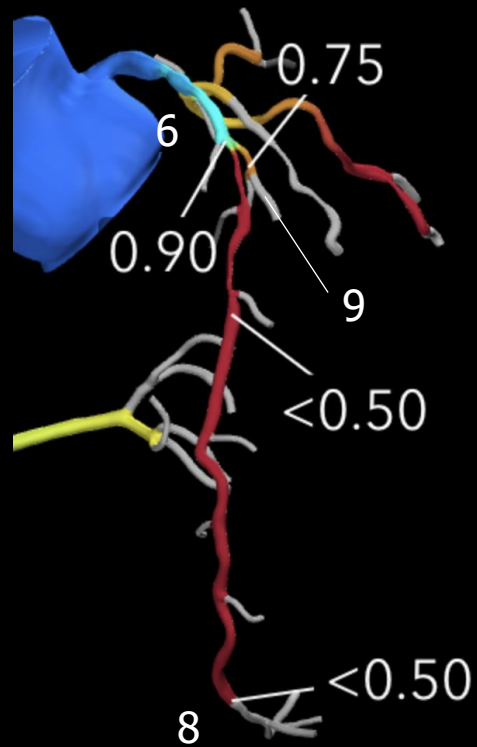
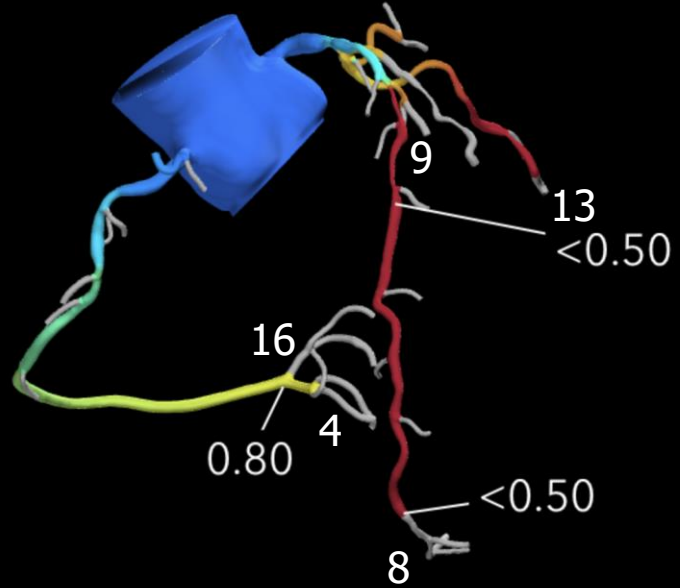
- Segment 12 (IM)
- Segment 12  
**Total: 4 pts**

- Segment 12a  
**Total: 2 pts**

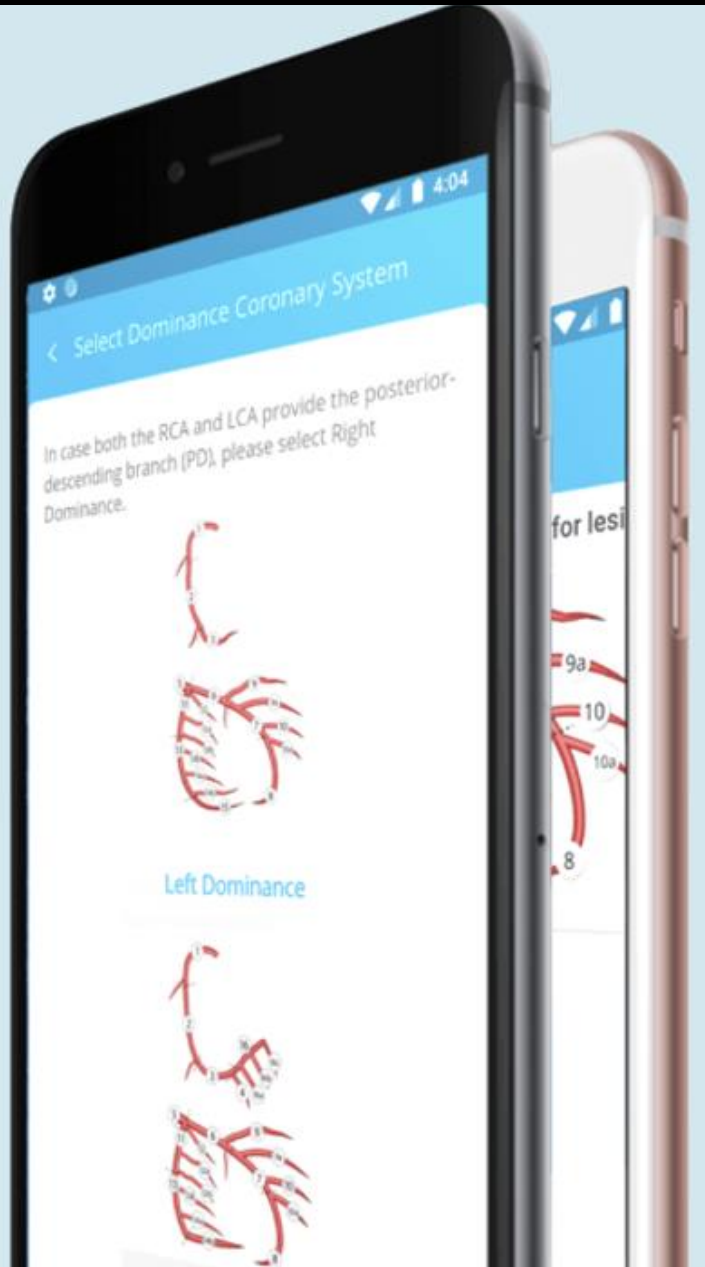


**Total anatomic SYNTAX score:  
58.5 pts**

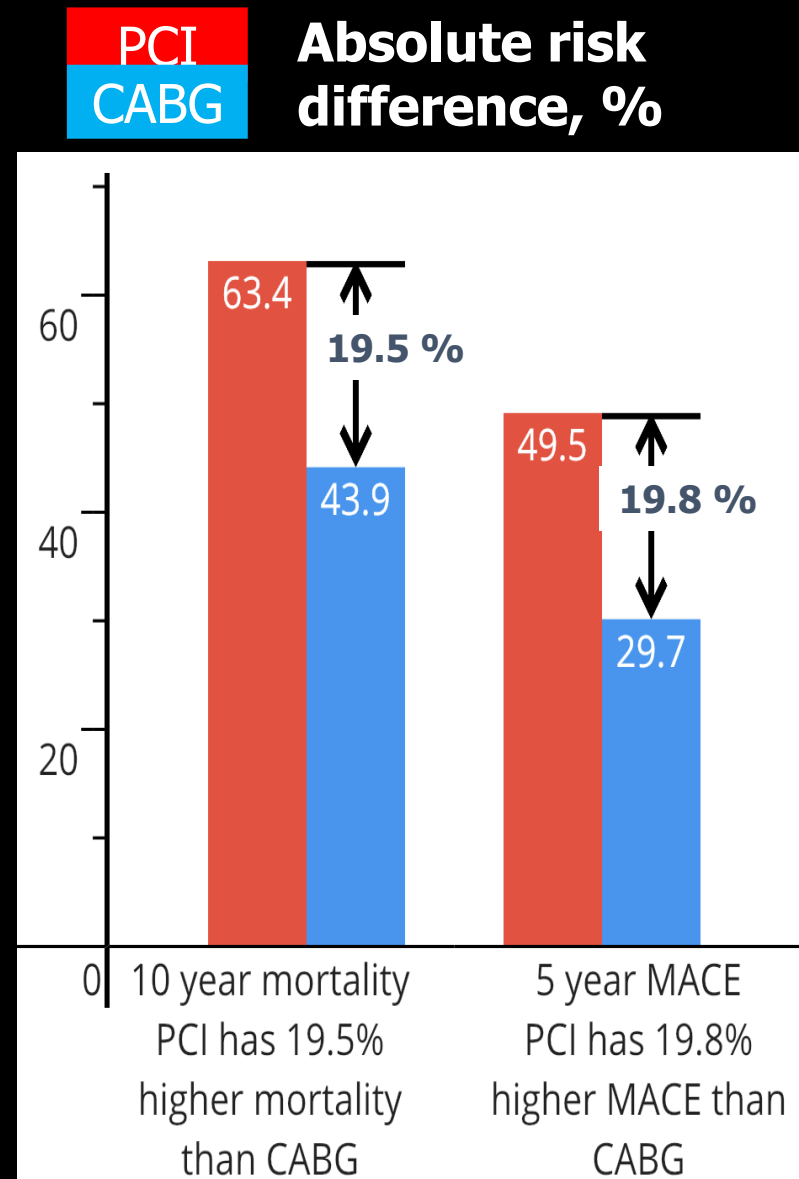
# Pre CABG FFR<sub>CT</sub>



# SYNTAX Score 2020 Predicts 5-year MACE and 10-year mortality



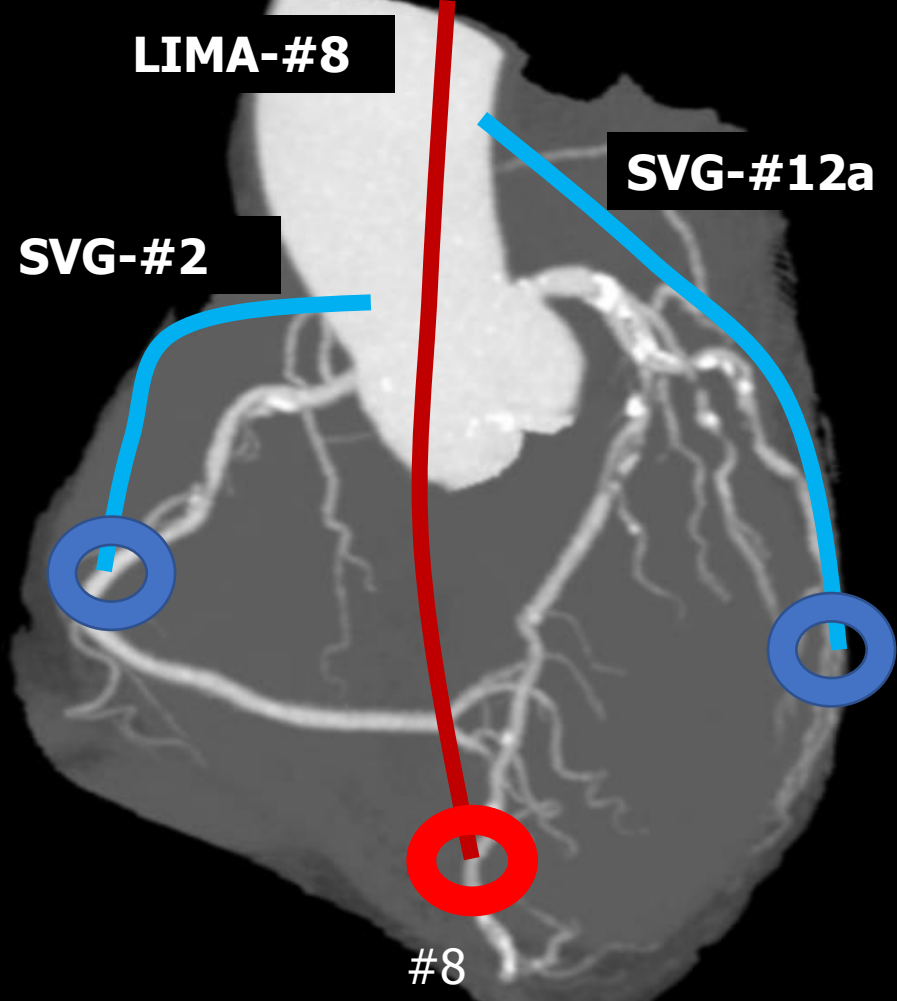
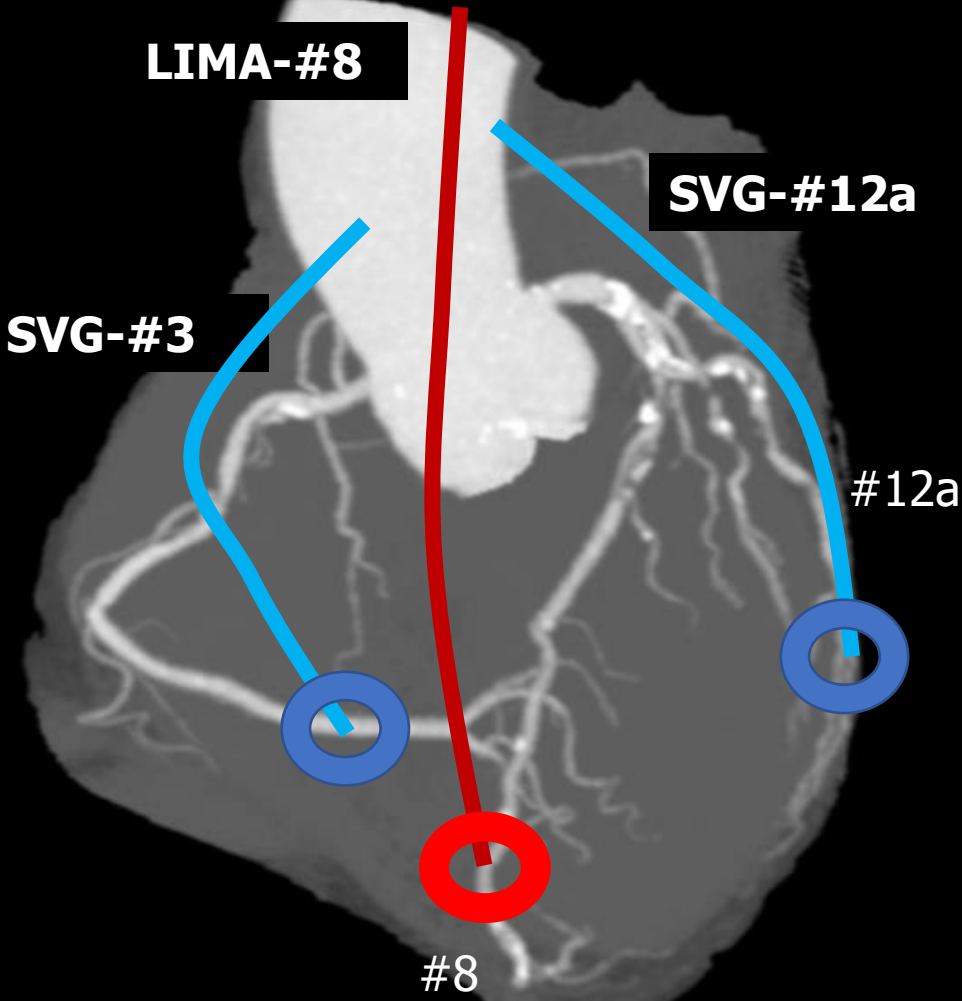
- **Anatomical SYNTAX score**  
**58.5**
- **Age (years)**  
**81**
- **CrCl (ml/min)**  
**71.0**
- **LVEF**  
**65.0%**
- **Left main disease**  
**Yes**
- **Gender**  
**Male**
- **COPD**  
**No**
- **Peripheral vessel disease**  
**No**
- **DM**  
**No**
- **Current Smoking**  
**No**





# CABG plan in "CCTA Planning and Operating Heart Team"

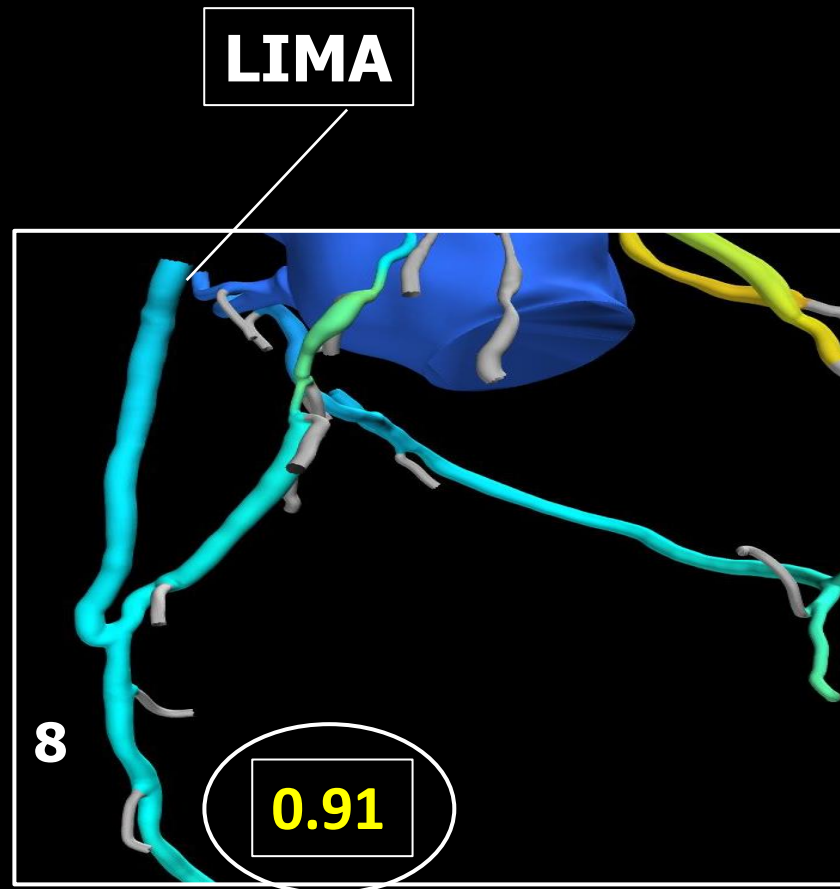
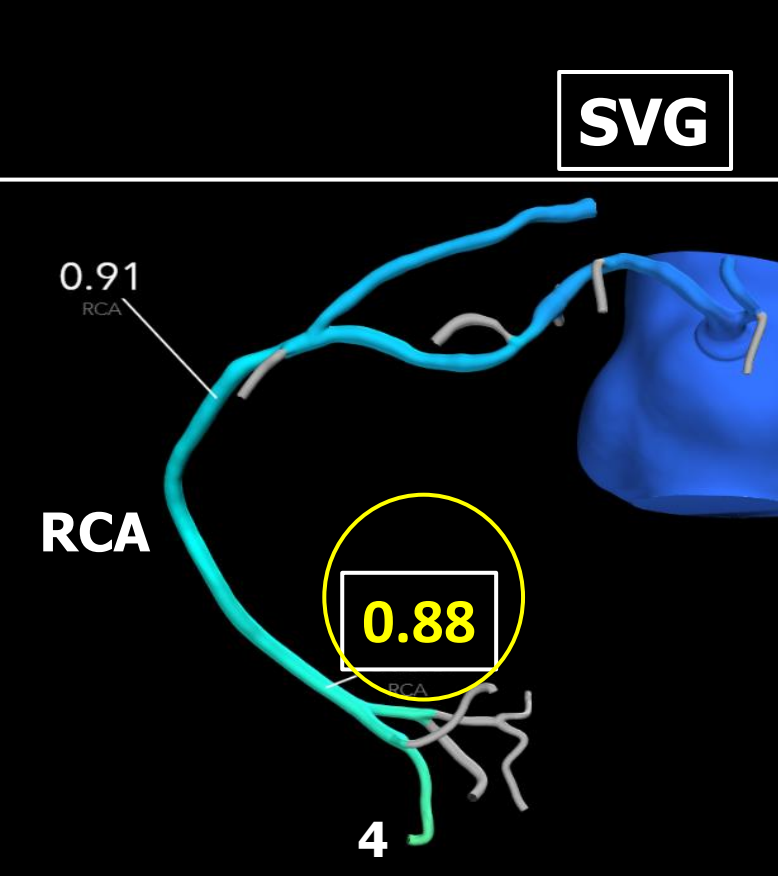
# Actual treatment of CABG



# CCTA (Hologram) post-CABG



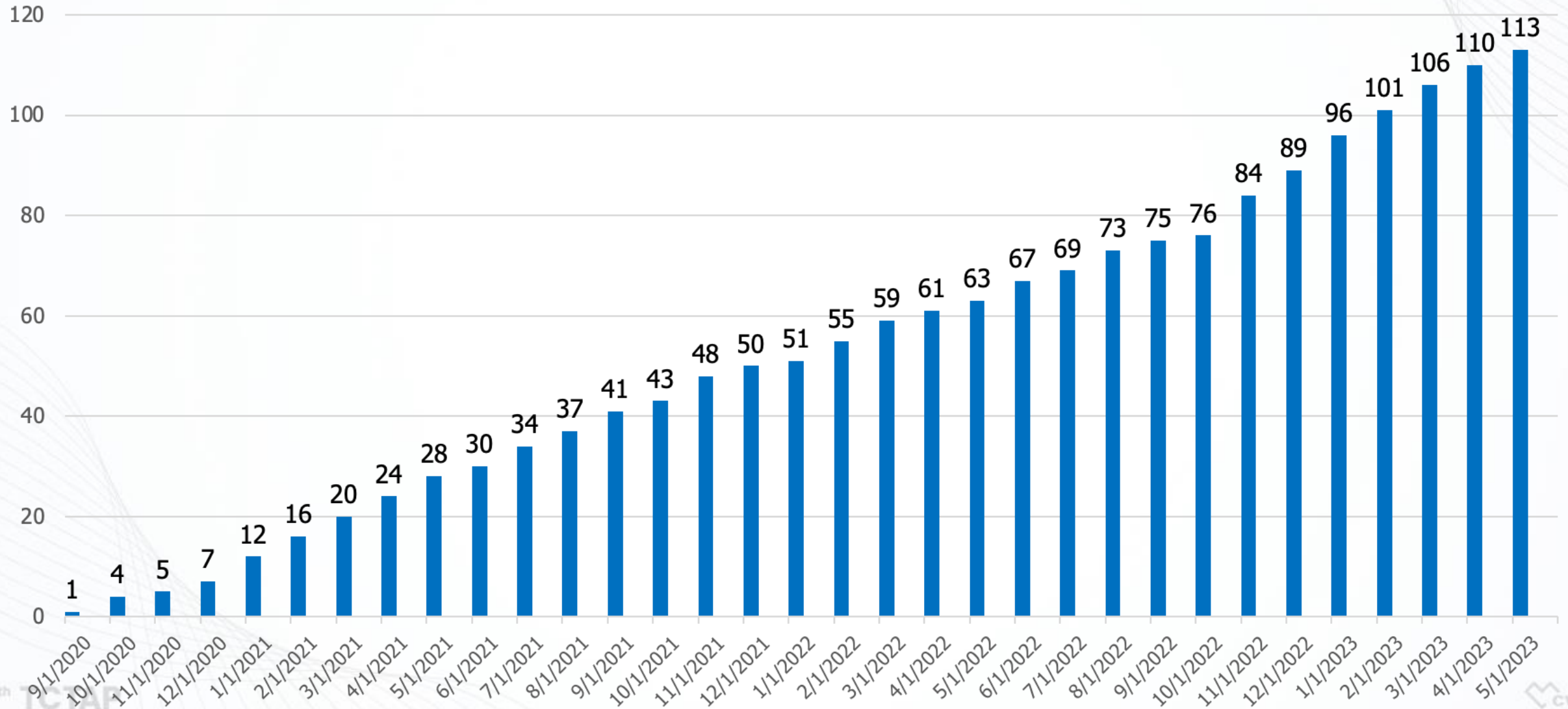
# Post CABG FFR<sub>CT</sub> 30 days safety assessment



**Enrolment is almost completed**  
**Sample size = 114 patients**

**LMCAD 16%**

## Cumulative enrolment of FASTTRACK CABG



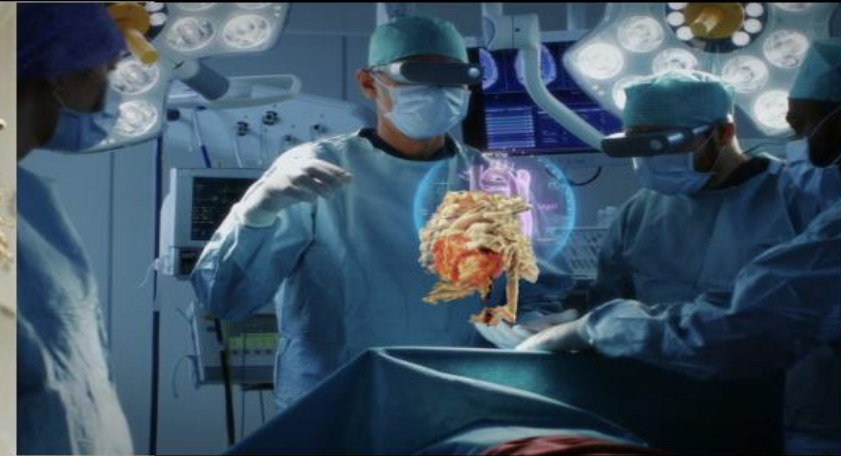
# In Galway, we have entered into the era of Mixed Reality: "Heart team new style"...with Hologram



**Heart Team**



**Surgeon on his way to  
operator room**



**Surgery theatre**



OLLSCOIL NA GAILLIMHÉ  
UNIVERSITY OF GALWAY





# Conclusion

- **In the 2019 ESC guidelines, CCTA with non-invasive functional imaging was given a Class I Level B recommendation as the initial test to diagnose CAD in symptomatic patients. In the recent ACC/AHA Chest Pain guidelines, CCTA received a Class 2a recommendation for guiding therapeutic decision-making in patient with chest pain.**
- **In complex CAD, CCTA can evaluate the total burden and severity of coronary artery disease (e.g., SYNTAX Score, Leaman Score).**
- **CCTA could be used as a “one-stop shop” diagnostic tool and decision-making between pharmacological treatment, PCI, and CABG.**
- **SYNTAX III REVOLUTION trial demonstrated that clinical decision-making between CABG and PCI based on CCTA had a high agreement with the treatment decision derived from ICA in patients with 3VD with or without left main disease.**
- **The ongoing FASTTRACK CABG trial investigates the feasibility and the safety of planning and executing CABG based solely on CCTA combined with  $FFR_{CT}$  without knowledge of anatomy defined by ICA.**