

CT-guided PCI

A novel approach for PCI Planning and Guidance

Carlos Collet MD, PhD

Co-director Catheterisation Laboratory

OLV Aalst, Belgium

Disclosure Statement of Financial Interest

Within the past 12+ months, Carlos Collet has had a financial interest/arrangement or affiliation with the organization(s) listed below.

Institutional Support

Abbott Vascular
HeartFlow Inc
GE Healthcare
ShockWave Medical
Boston Scientific
Insight Lifetech
Pie Medical
Medis Medical Imaging

Equity/stock options

Medyria
Xenter

Consultancy fees

Abbott Vascular
HeartFlow Inc
GE Healthcare
Boston Scientific
Insight Lifetech
Early Bird
Pfizer
Siemens

Others

CoreAalst BV
Patents filed: US20220164950A1, US20220175260A1,
WO2022136637A1 and WO2021224458A1

One image two interpretations



I cannot interpret
lesion severity
(blooming calcium)



Radiologist

Rota or IVL?
(HeartTeam before PCI)

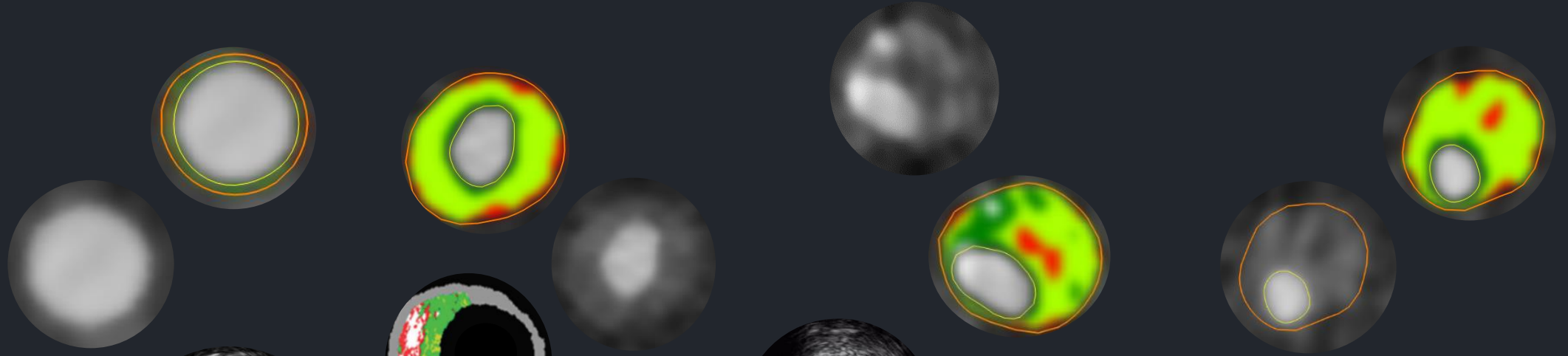


Interventional Cardiologist

Imaging Atherosclerosis in 2023

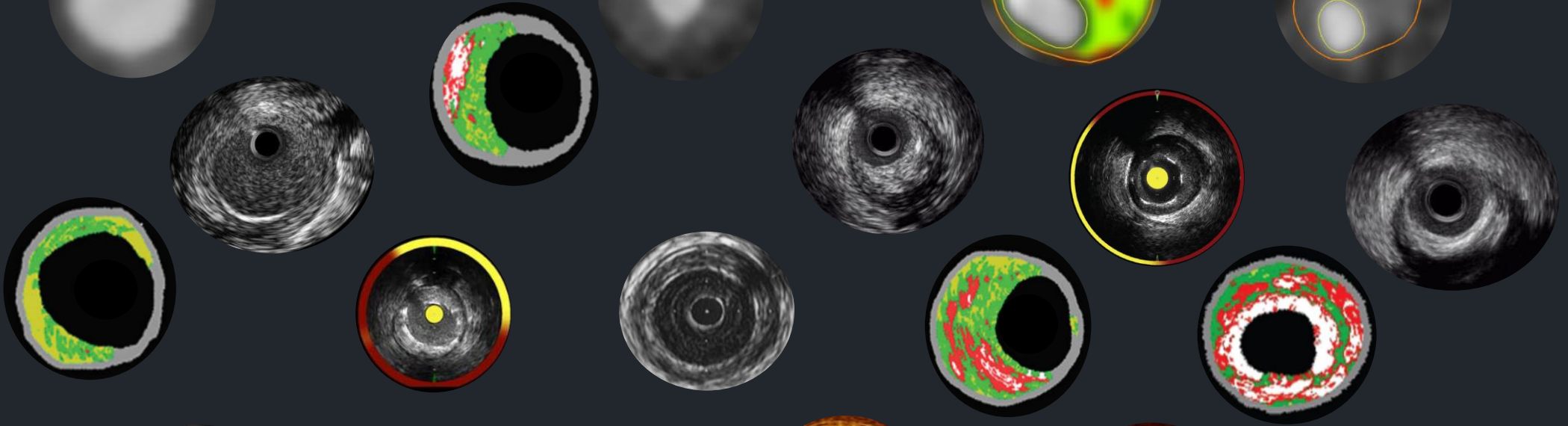
CCTA

230-500 μm



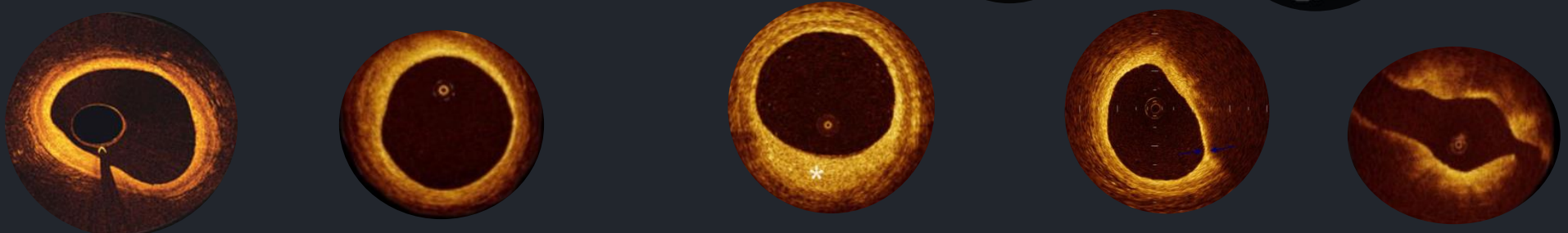
IVUS-VH
(NIRS)

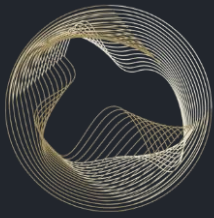
100-200 μm



OCT

10-20 μm



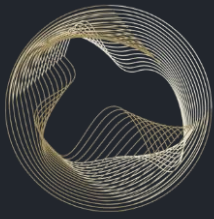


CT-Guided PCI

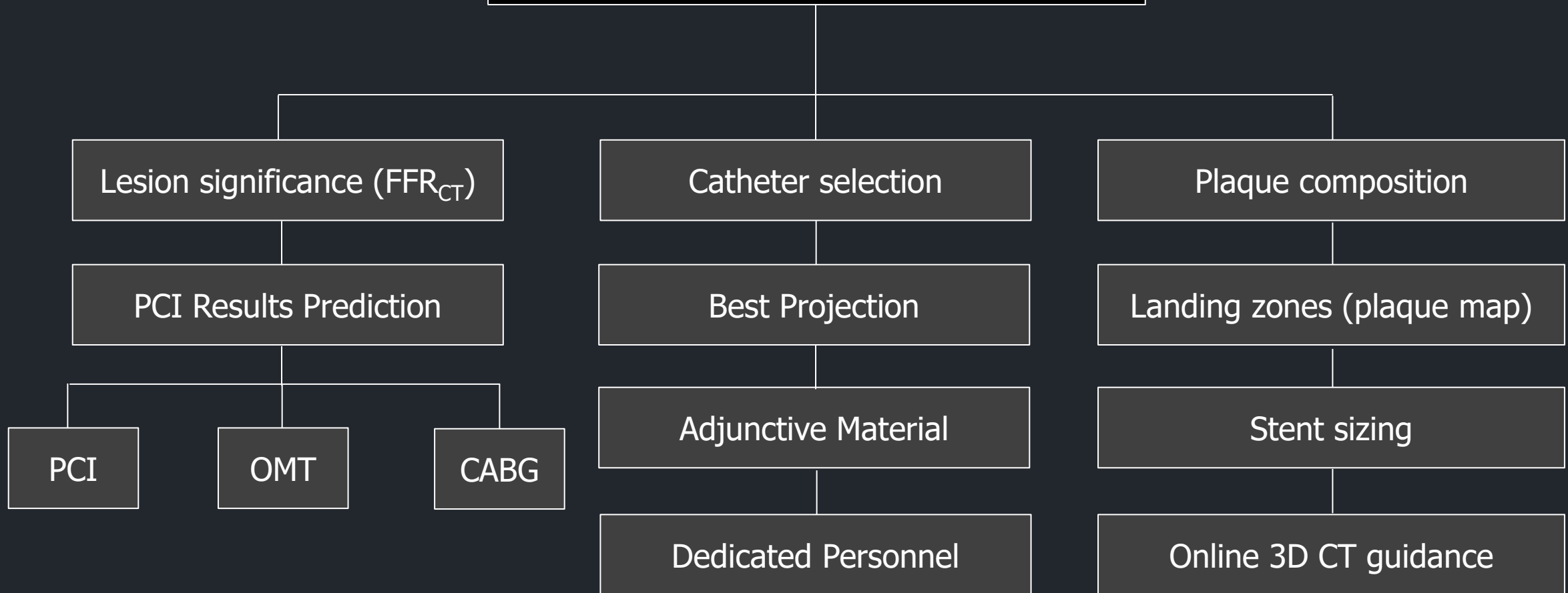
Diagnostic Evaluation
and Treatment
Planning

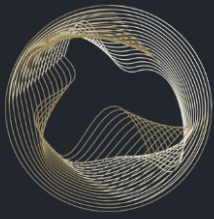
Cath-lab Preparation
(personnel and
materials)

Online PCI Guidance

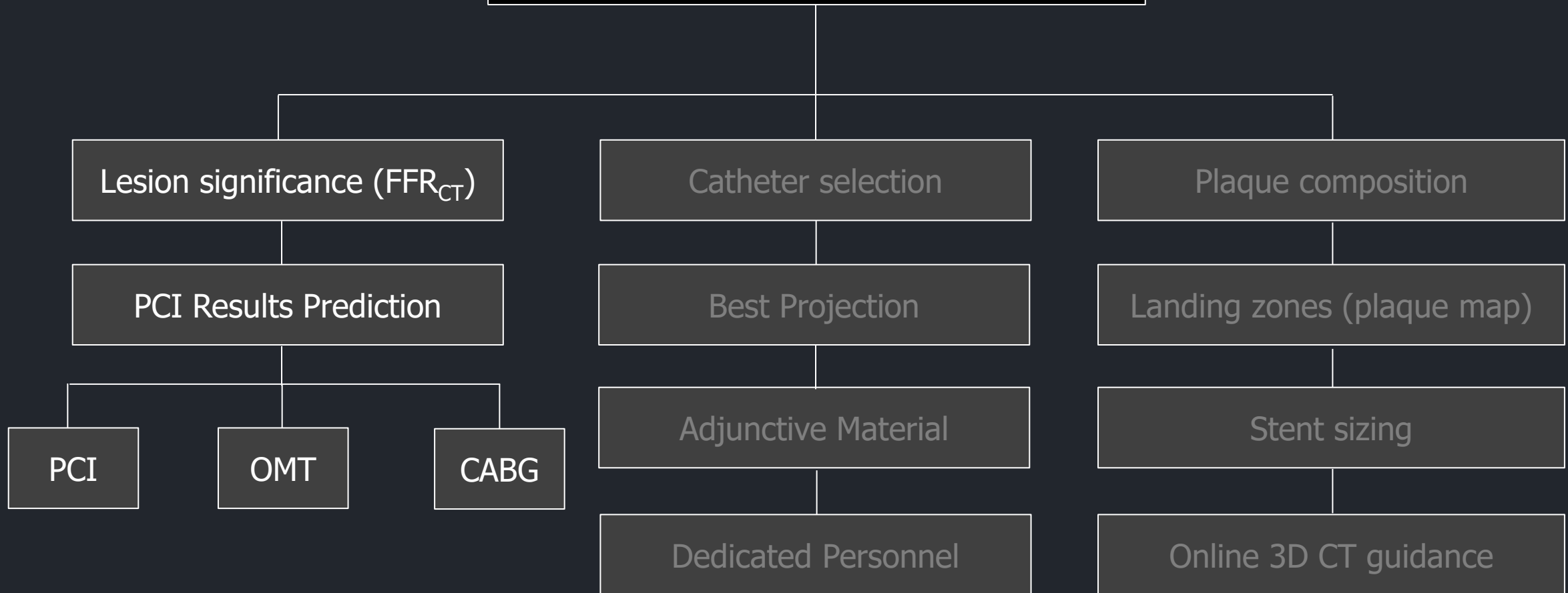


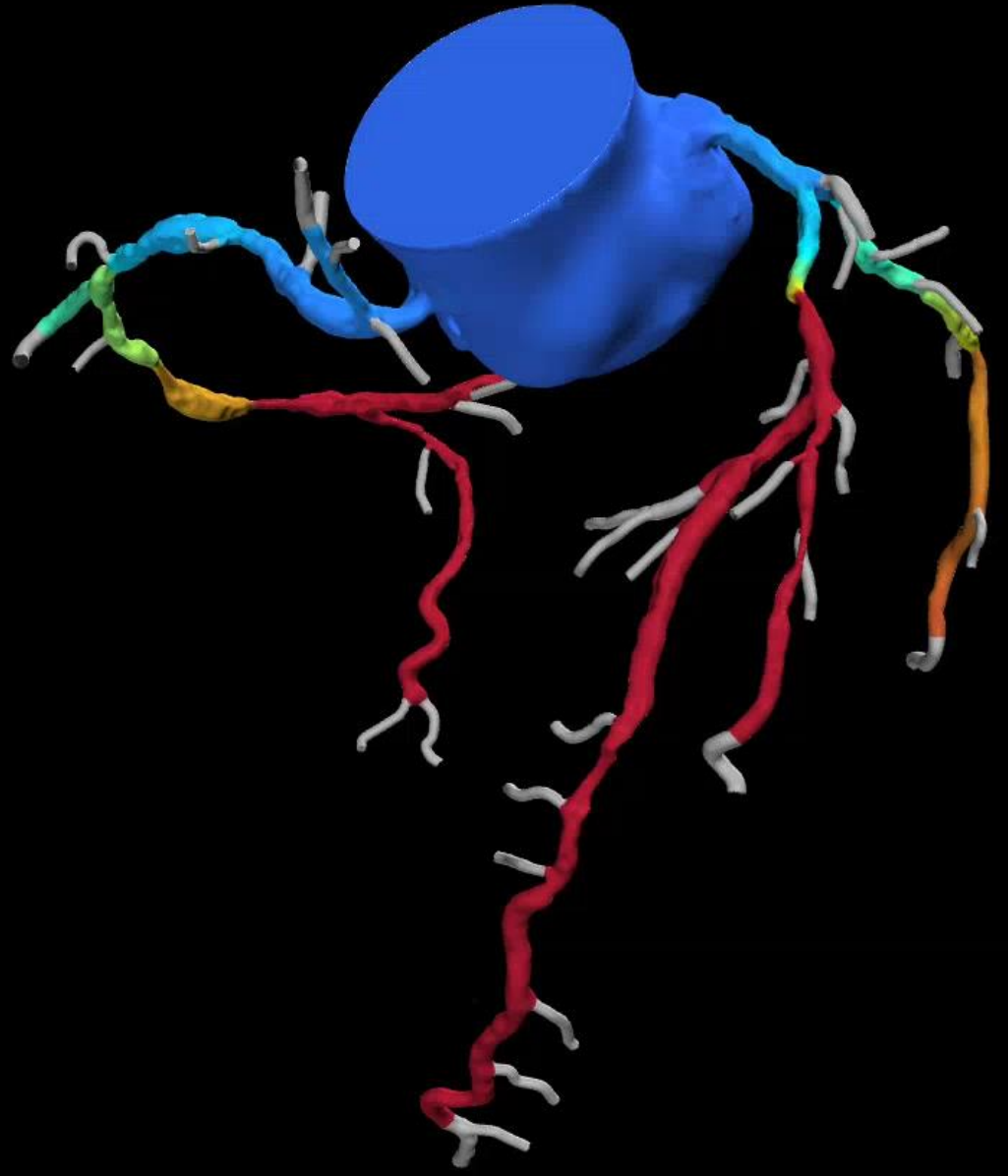
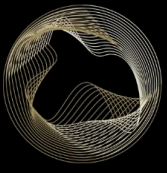
CT-Guided PCI

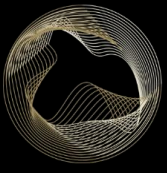




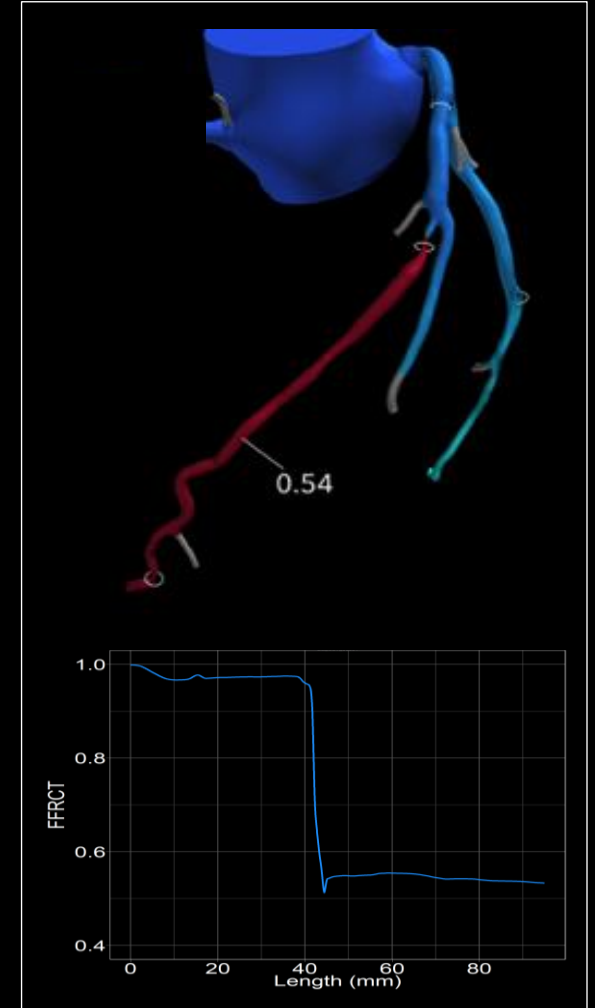
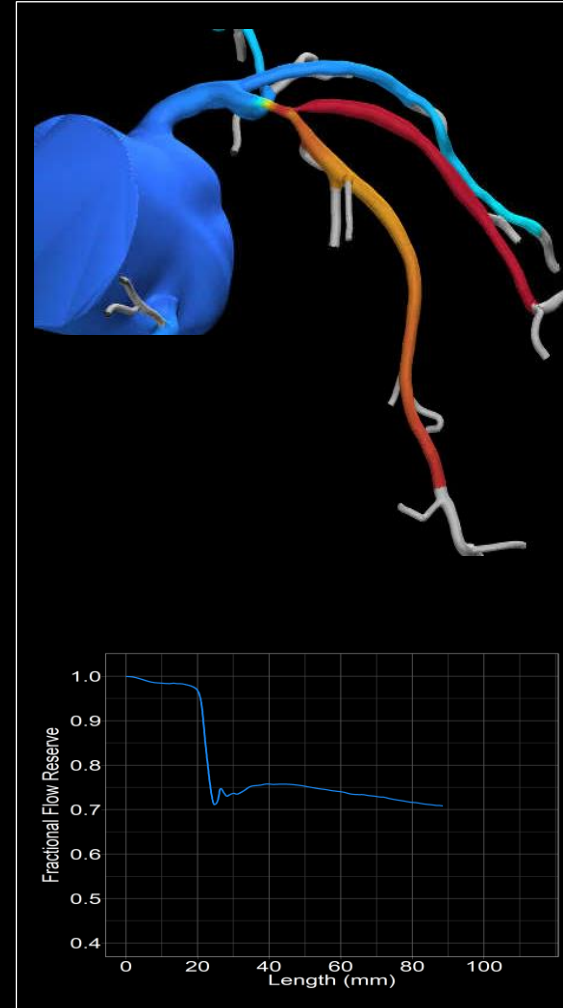
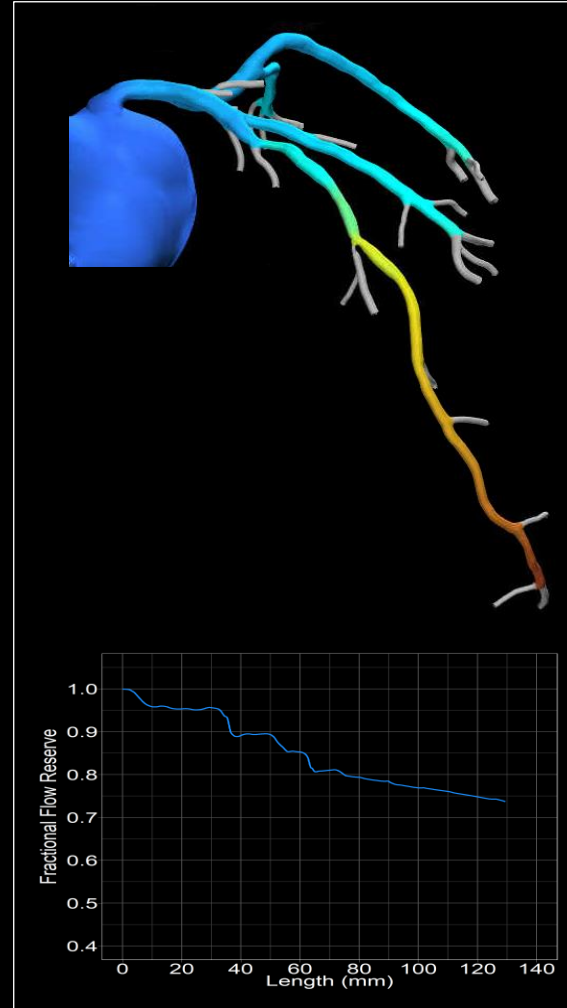
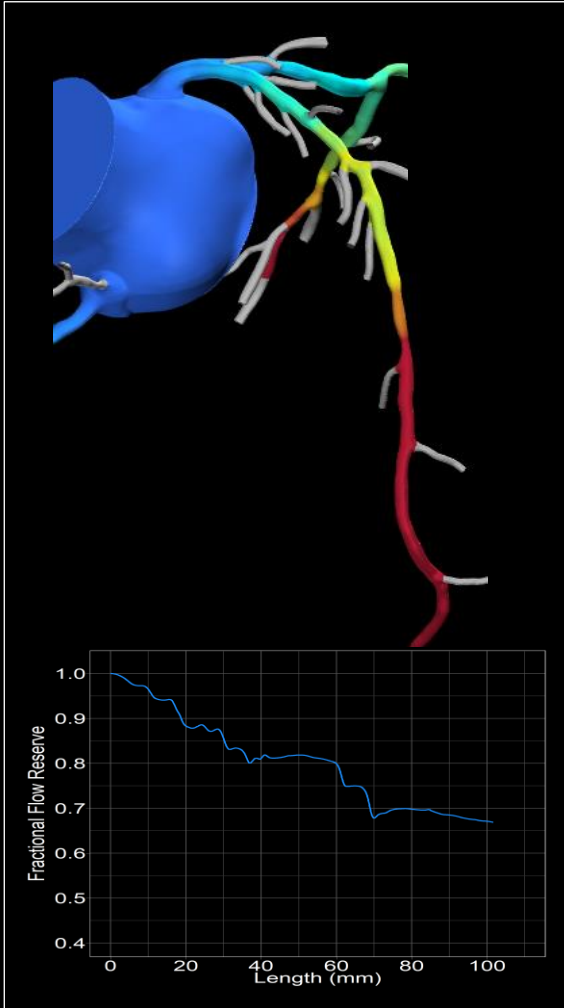
CT-Guided PCI







FFR_{CT} CAD Patterns



Diffuse CAD

Focal CAD

0



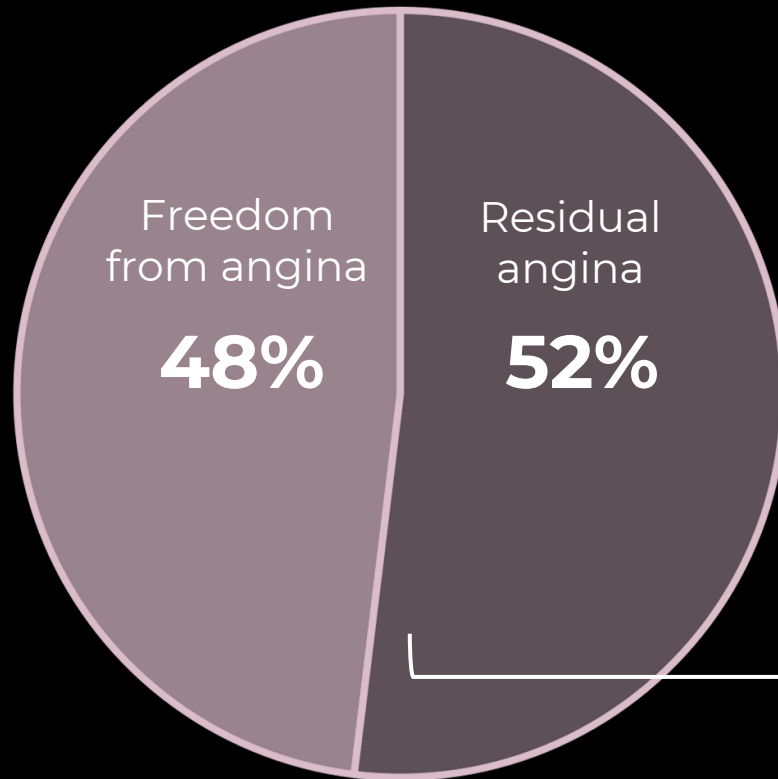
PPG



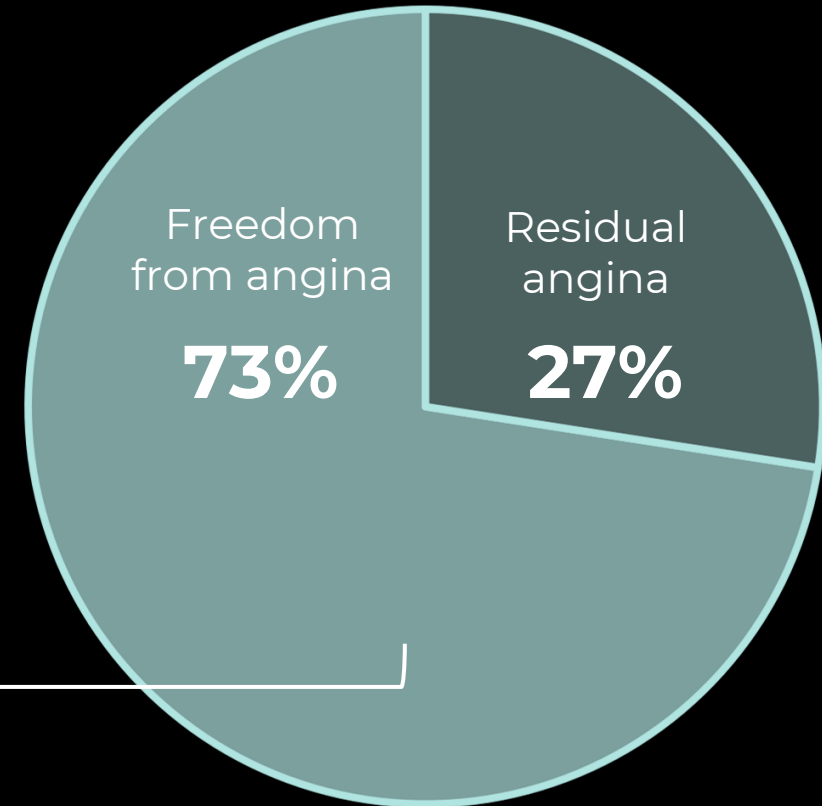
1

PPG and patient-reported outcomes

Diffuse CAD (Low PPG)

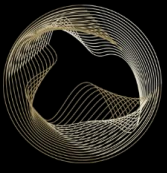


Focal CAD (High PPG)

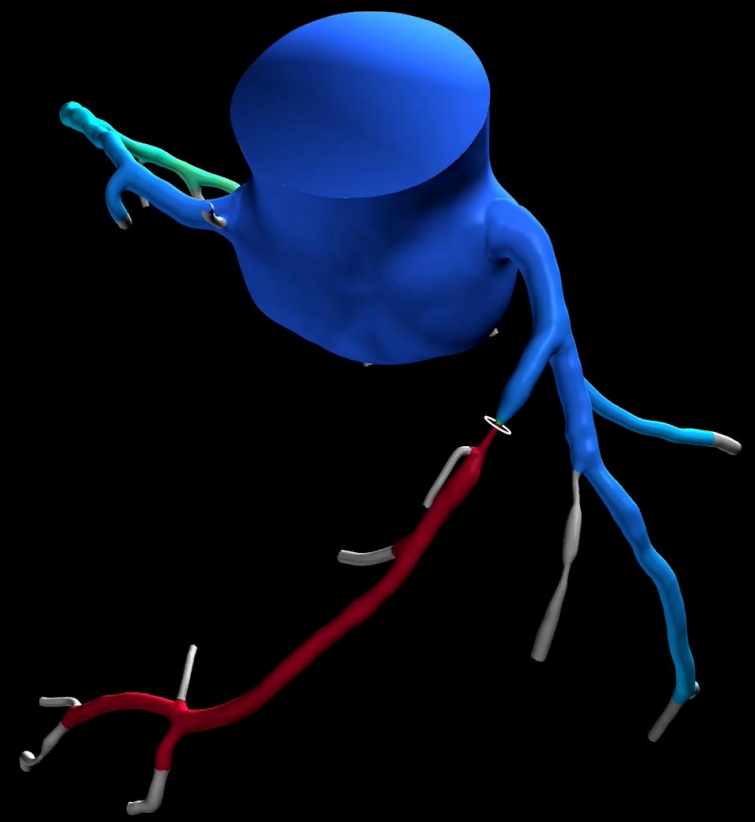
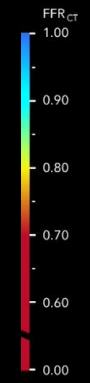
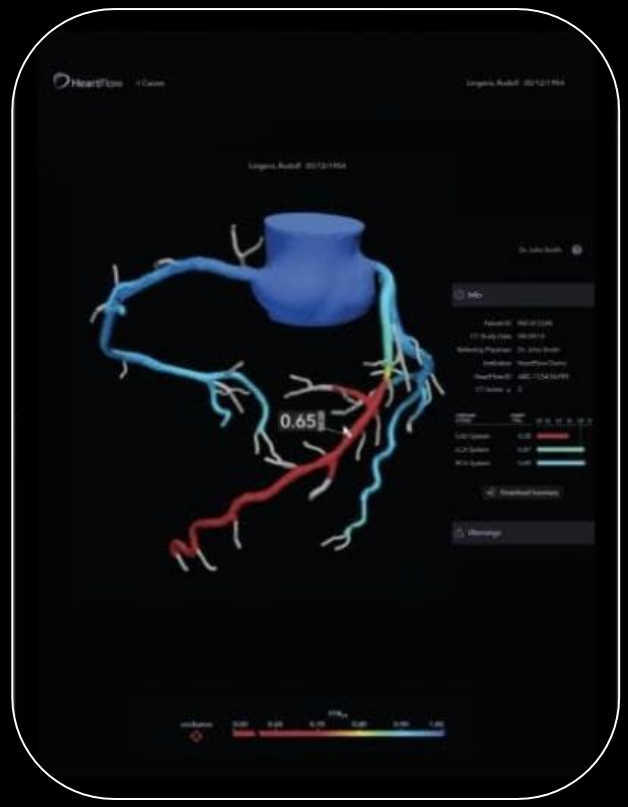


P-value = 0.02

Freedom from Angina is defined as SAQ-7 = 100

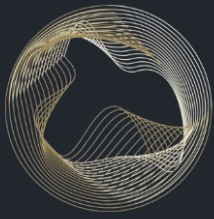


FFR_{CT} Planner

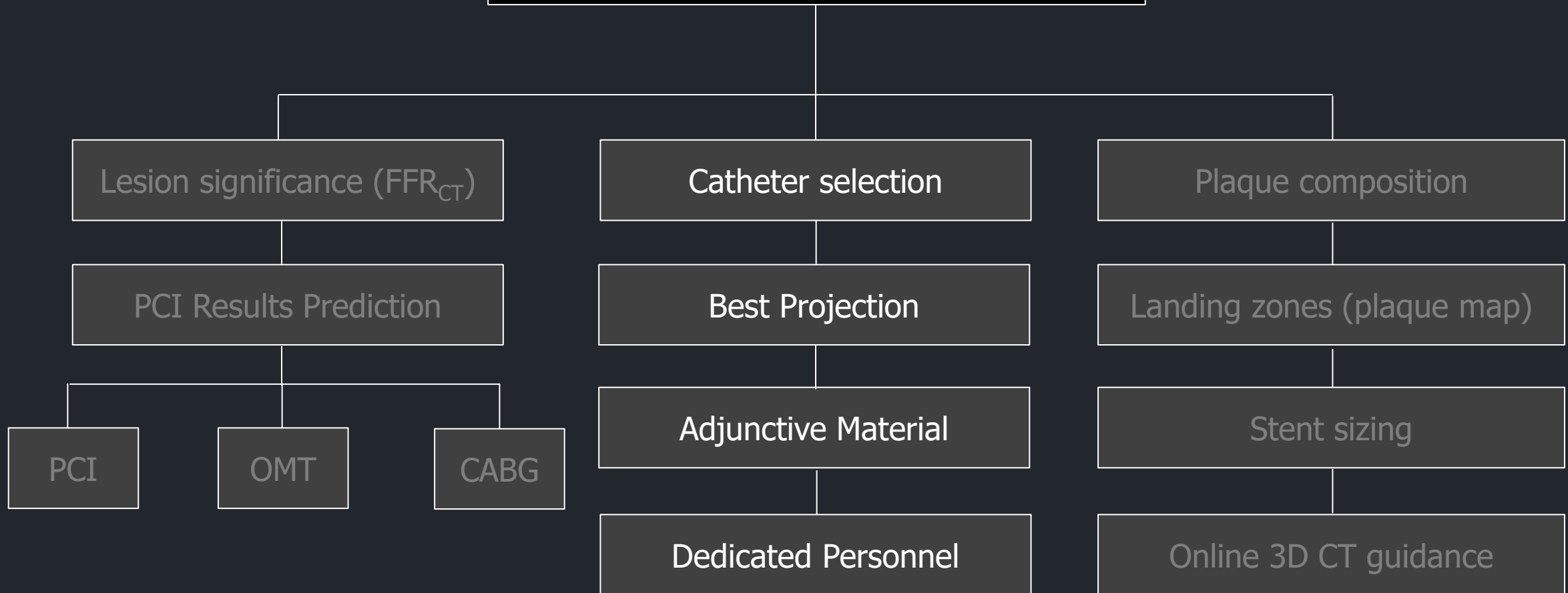


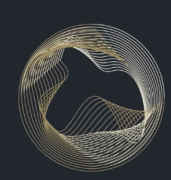
Reset View

Angles



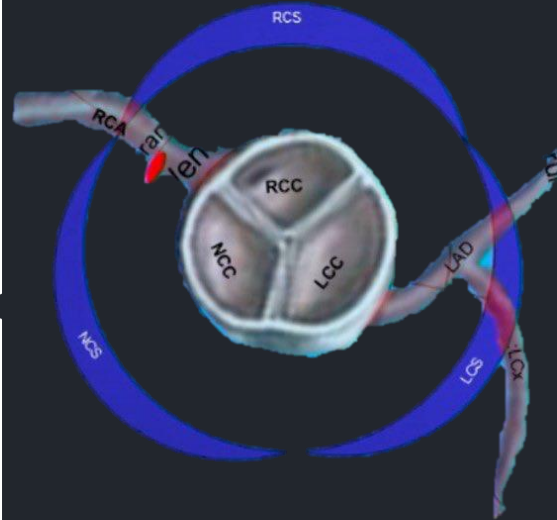
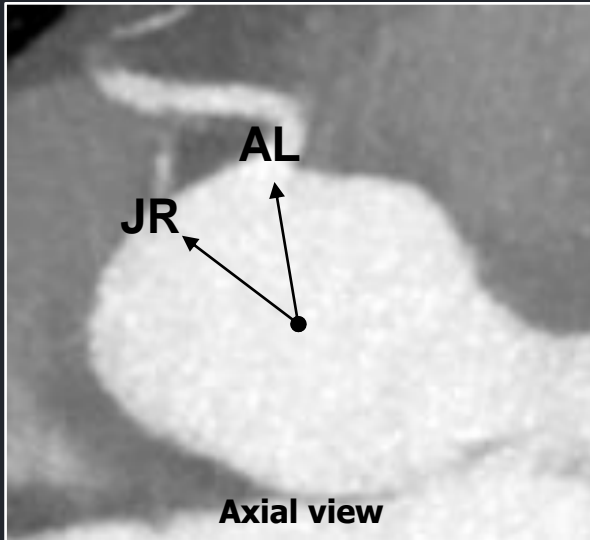
CT-Guided PCI





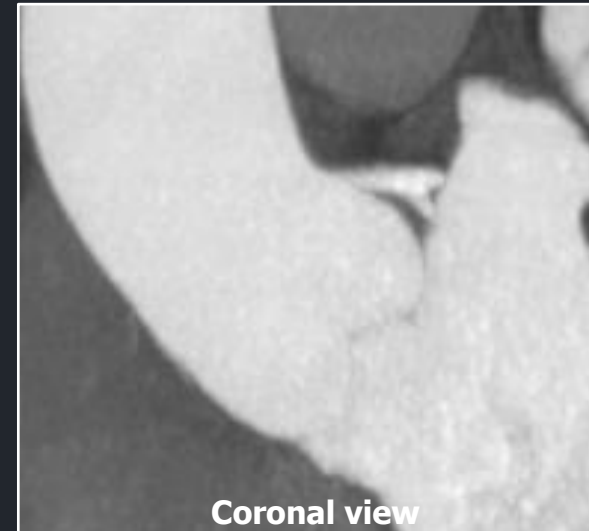
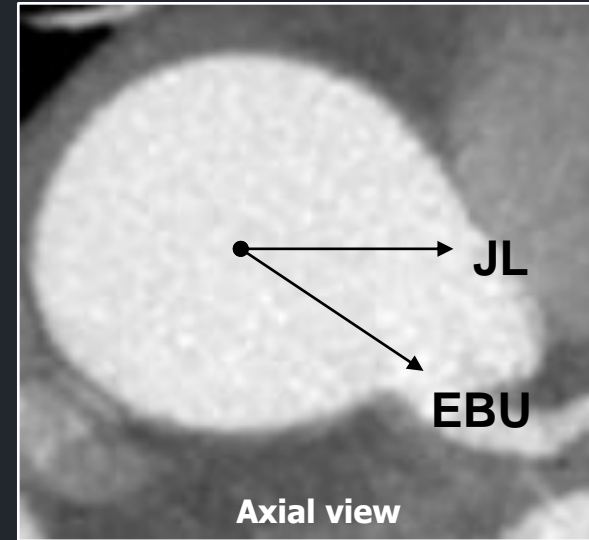
Coronary Ostia Position

Right Coronary Artery



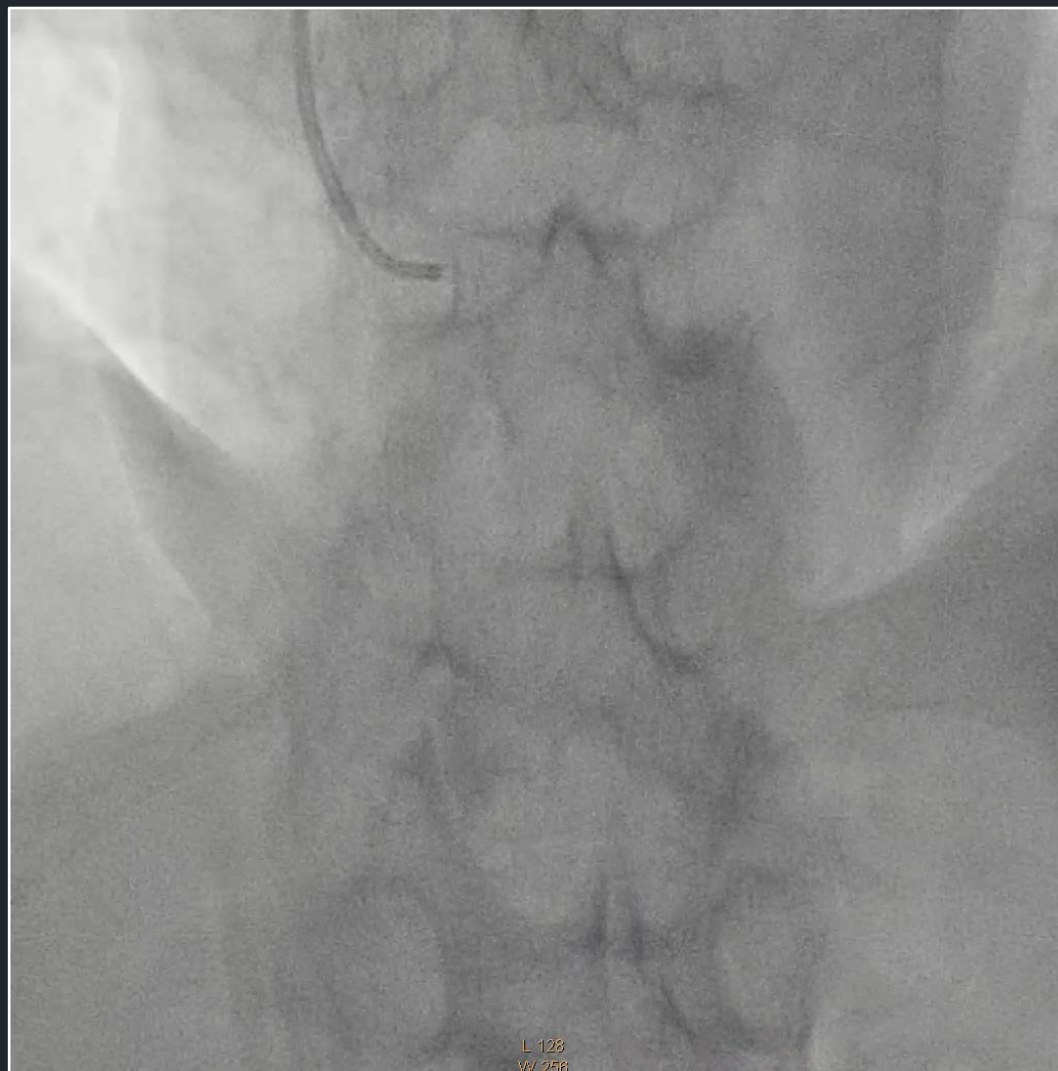
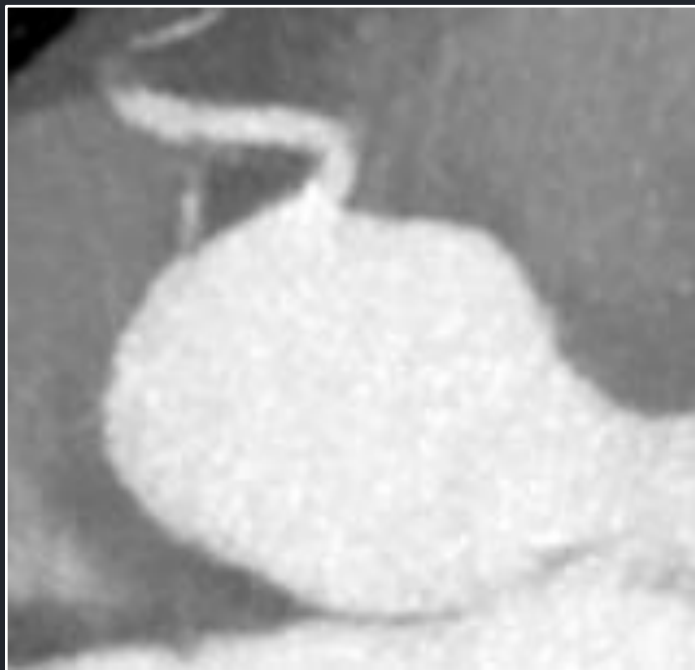
Normal Ostia Position

Left Coronary Artery



Anterior take-off RCA

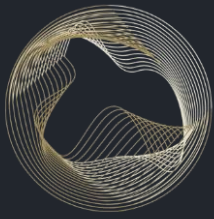
CT axial view



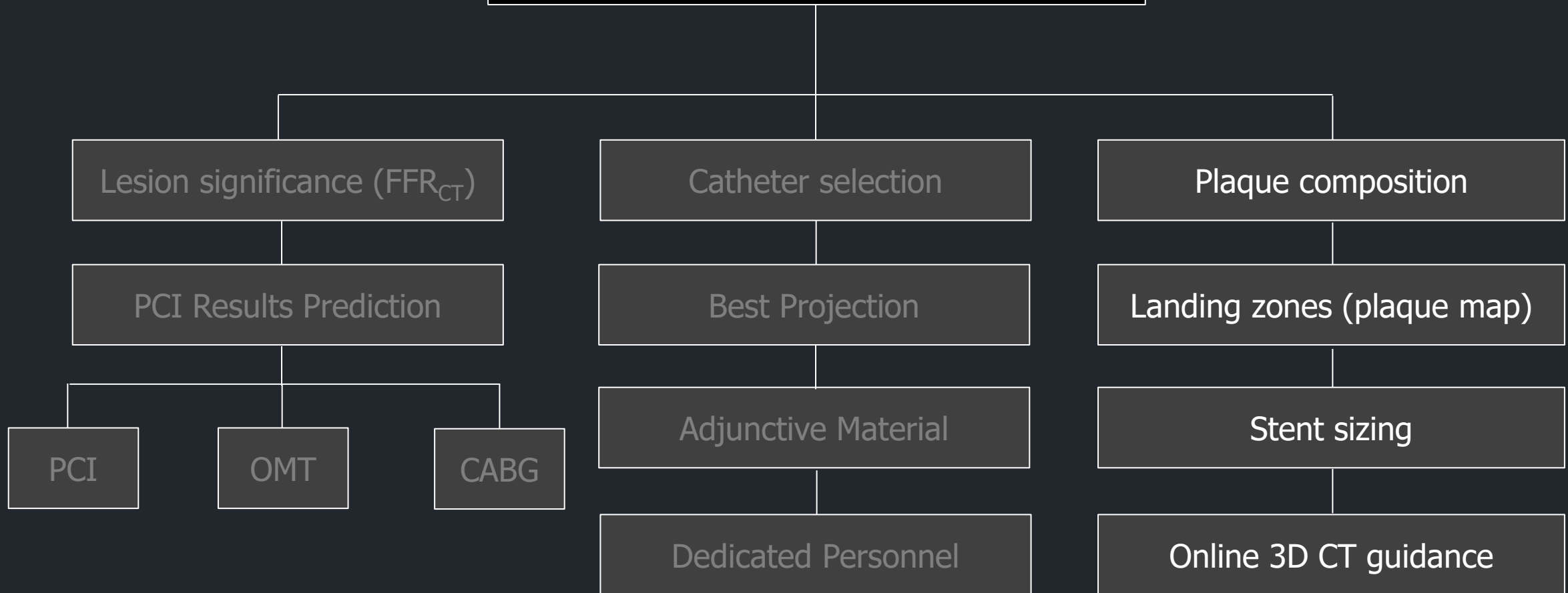
Planning: Case Complexity

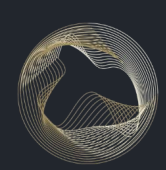
Anticipate case complexity





CT-Guided PCI



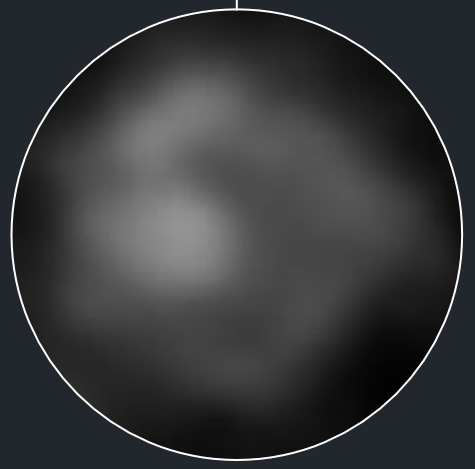


CT Plaque Assessment

Lipidic

Fibrotic

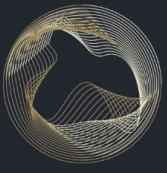
Calcified



Low HU (<30-50) ± positive remodelling

Intermediate HU intensity (50-180)

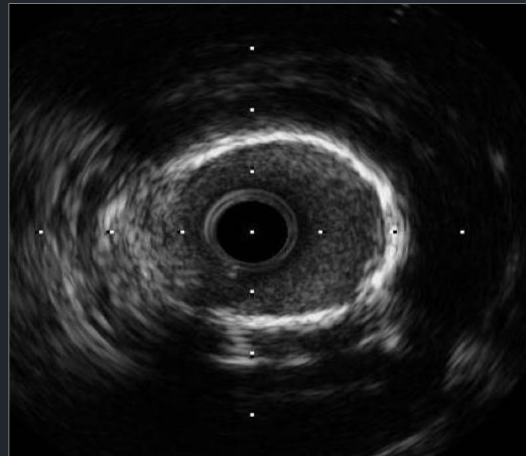
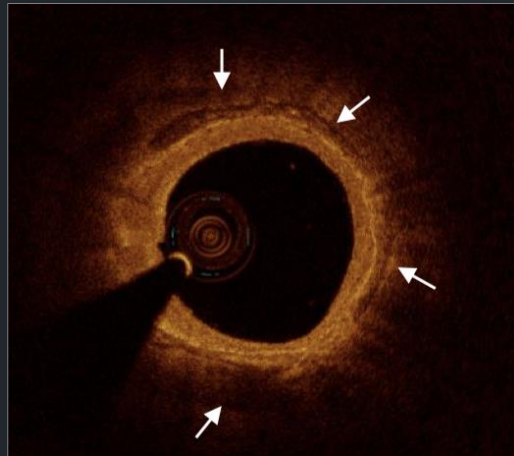
High HU intensity (>320)



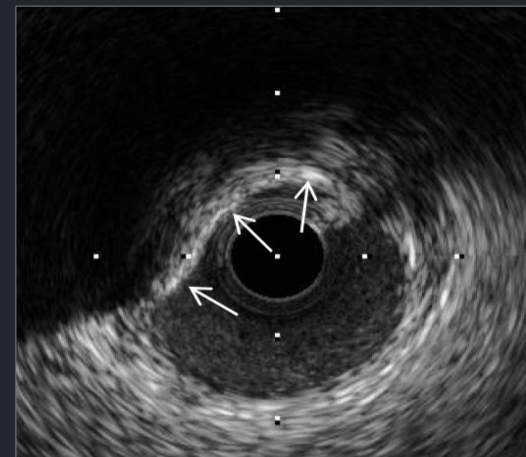
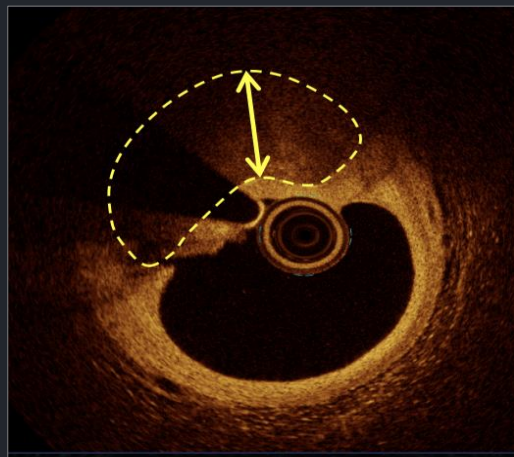
Calcific Plaque Quantification

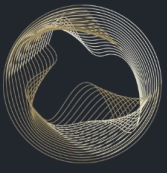
Calcium thickness

Thin



Thick

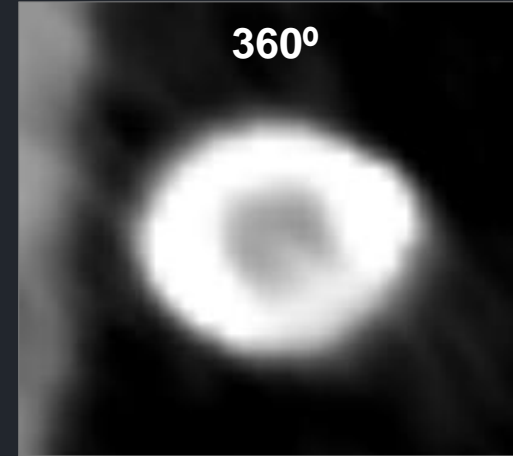
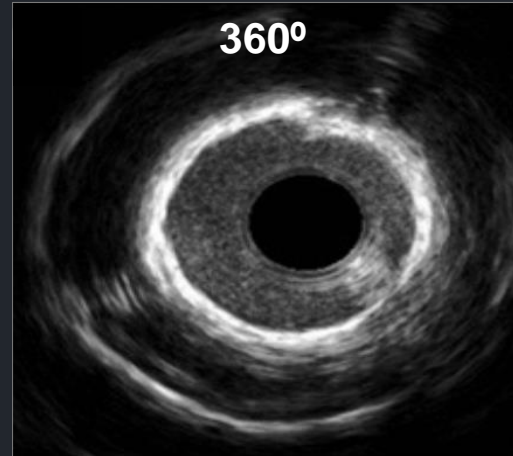
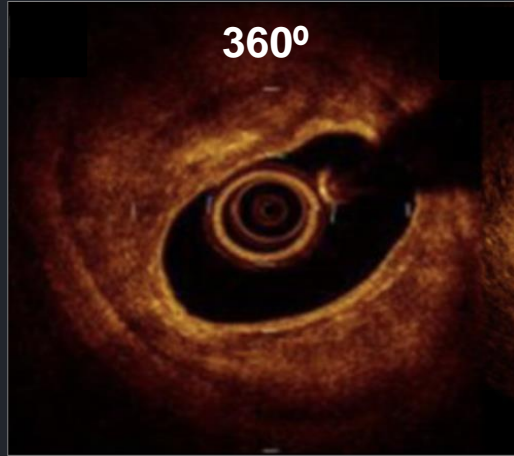




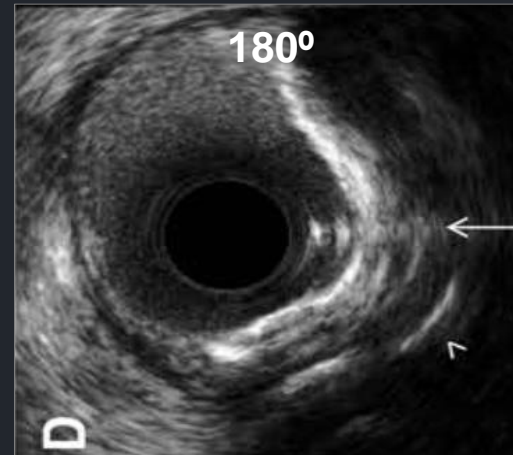
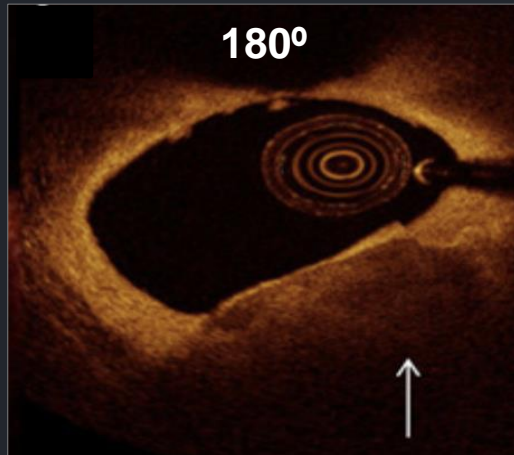
Calcific plaque quantification

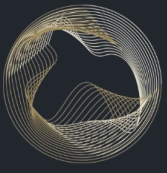
Calcium arc

Circumferential



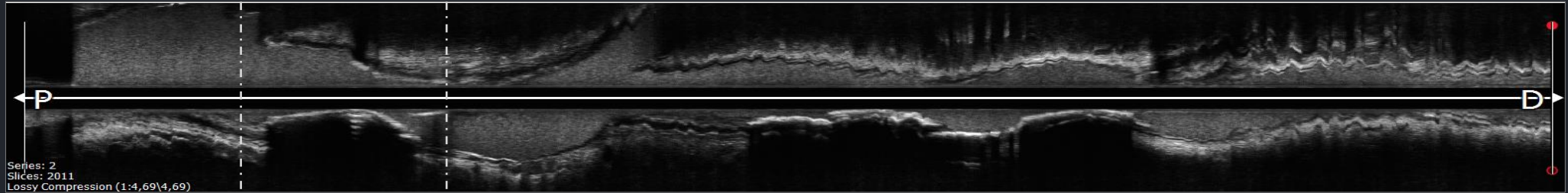
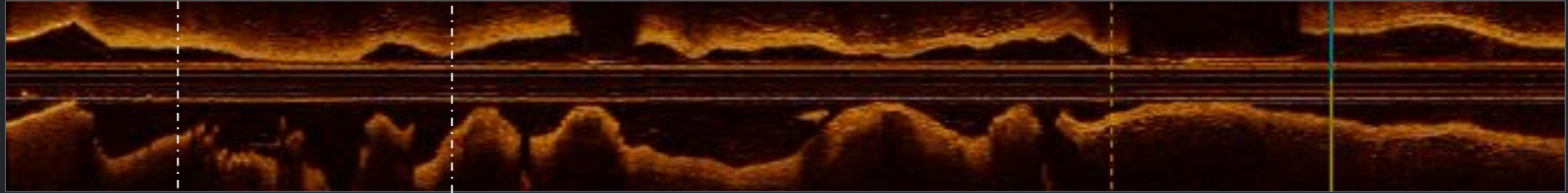
Not circumferential

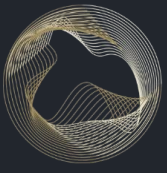




Calcific plaque quantification

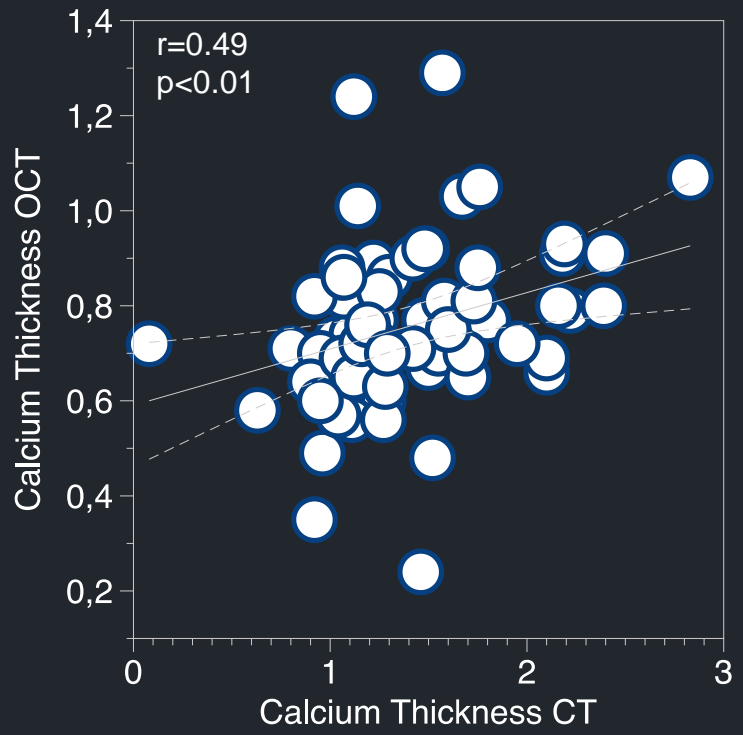
Calcium length



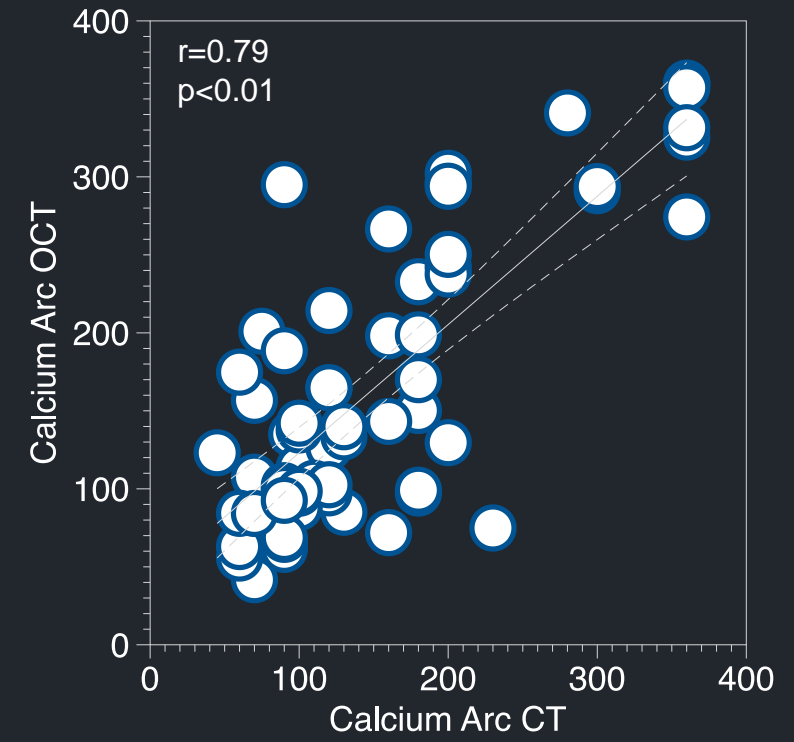


Calcific plaques: CTA versus OCT

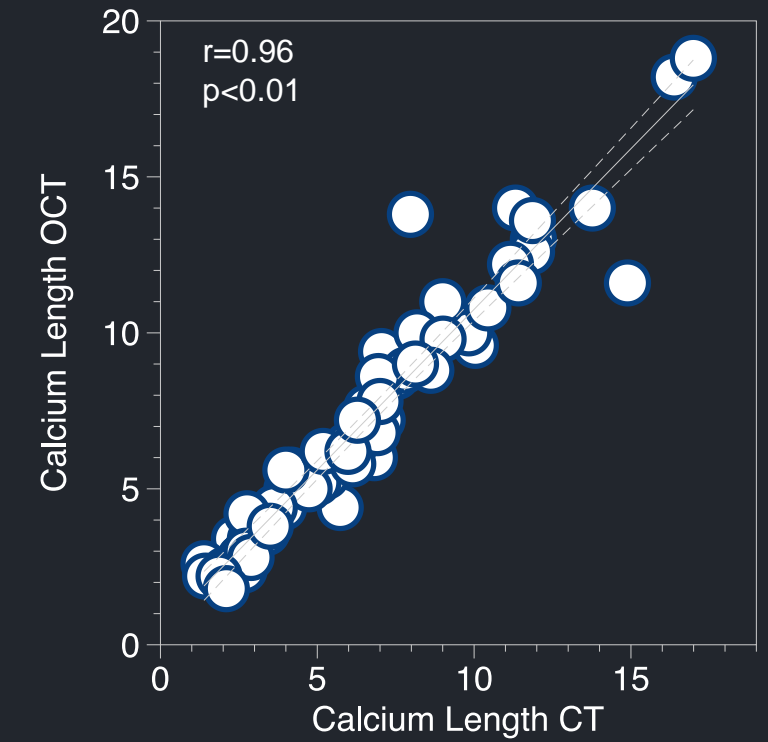
Thickness

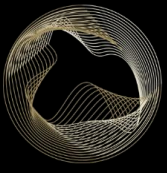


Arc



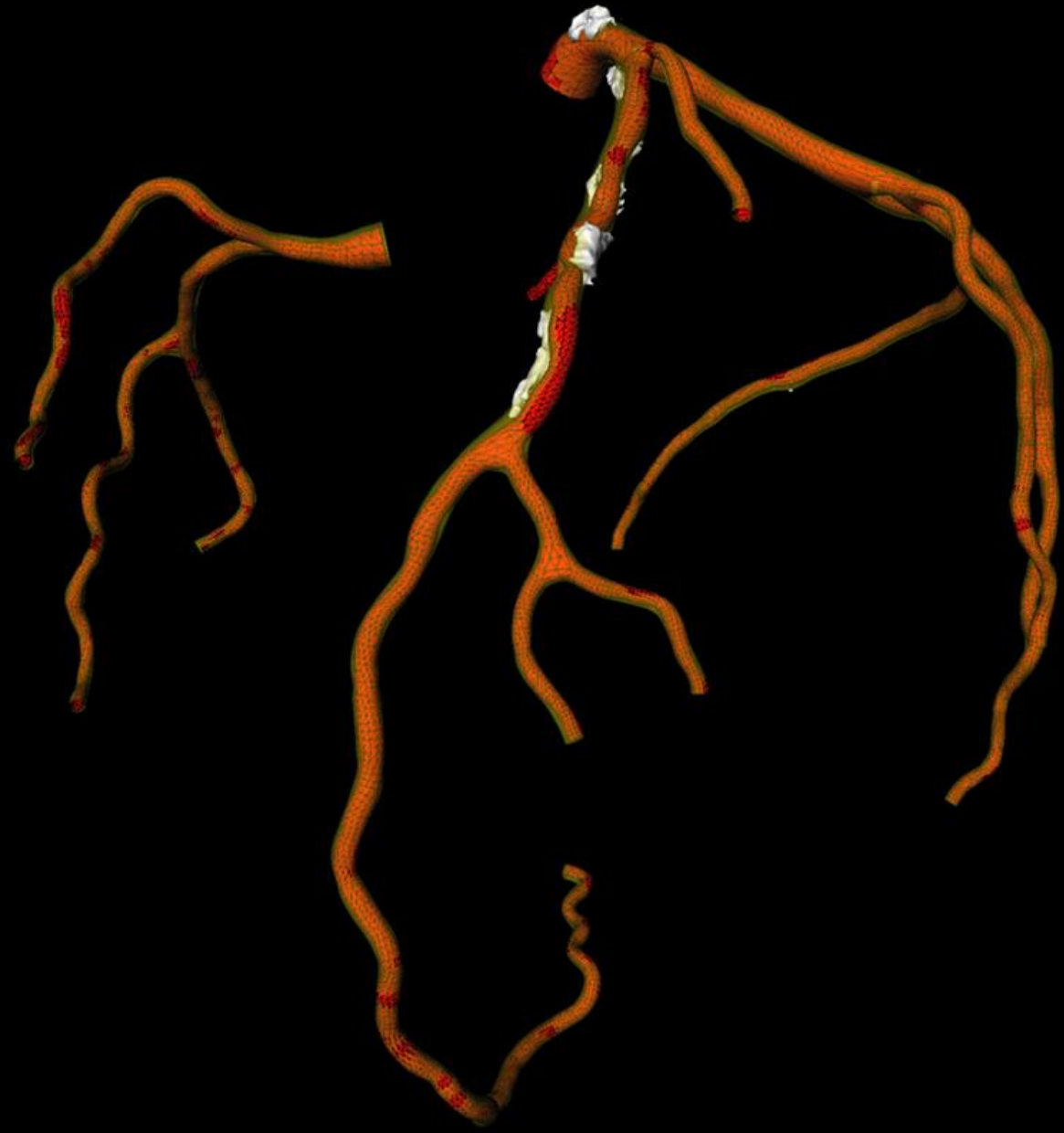
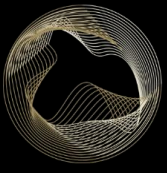
Length





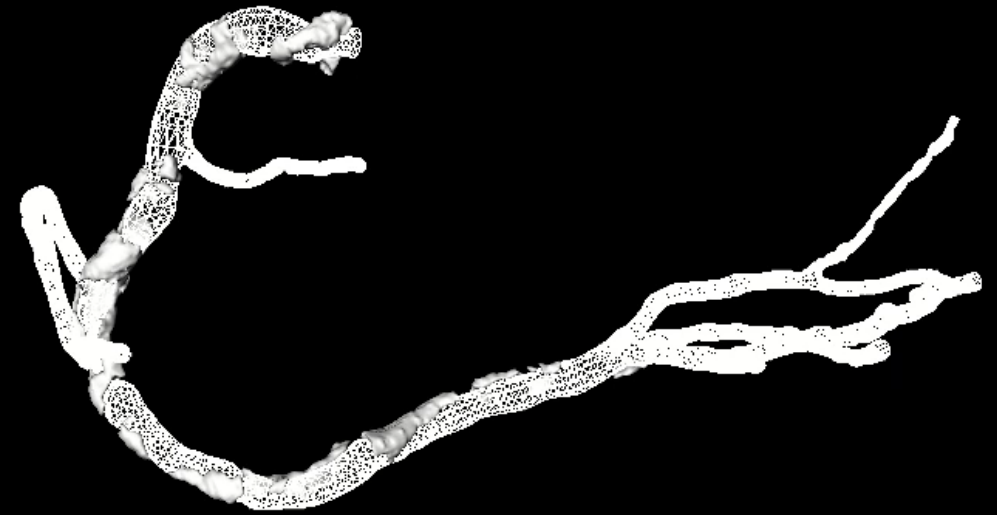
Live Plaque Map



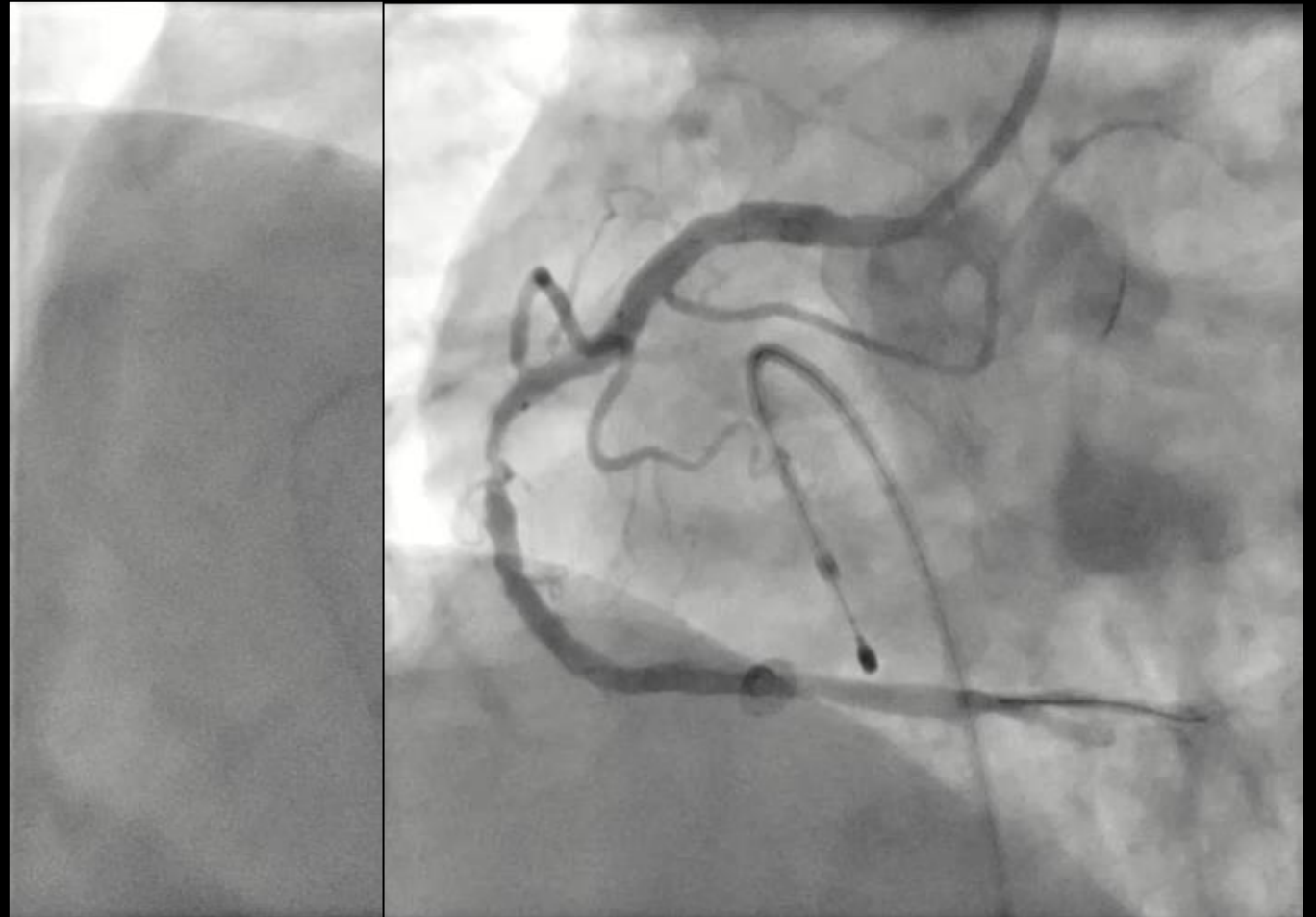




RCA 3D Calcium Reconstruction

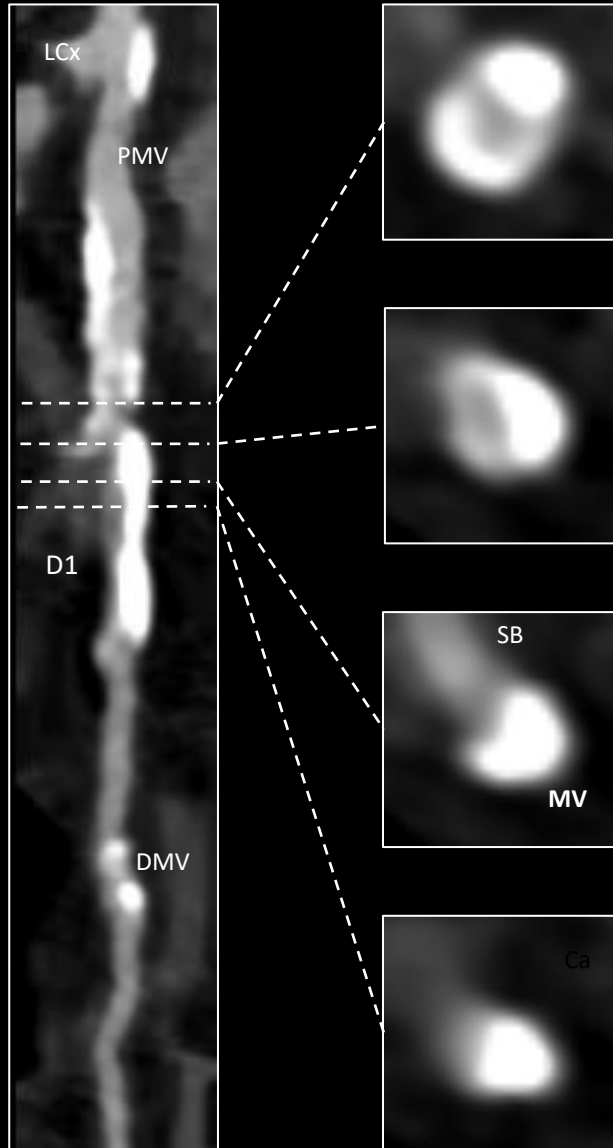


CT Guided Calcium Modification





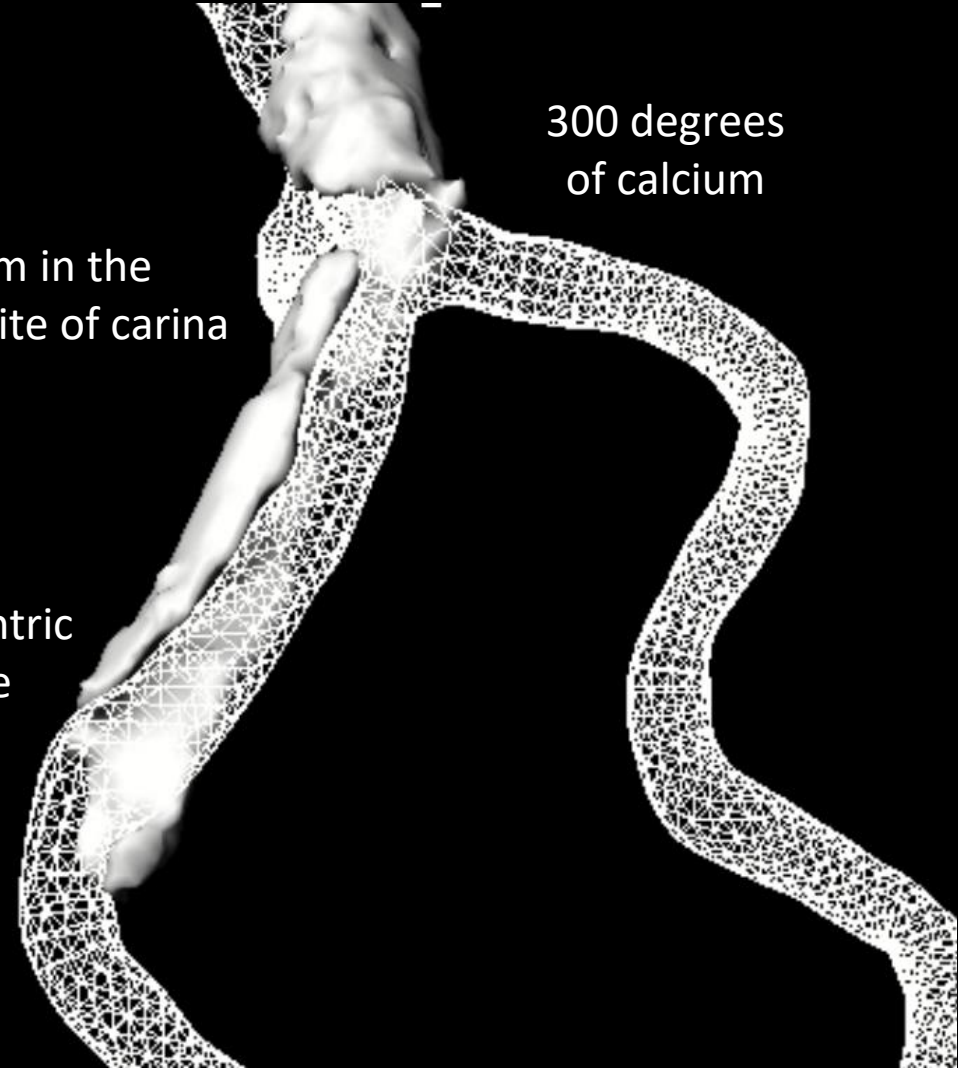
3D Calcium Map



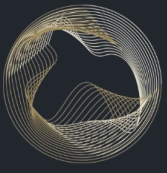
Long non-concentric
calcific plaque

Calcium in the
opposite site of carina

300 degrees
of calcium



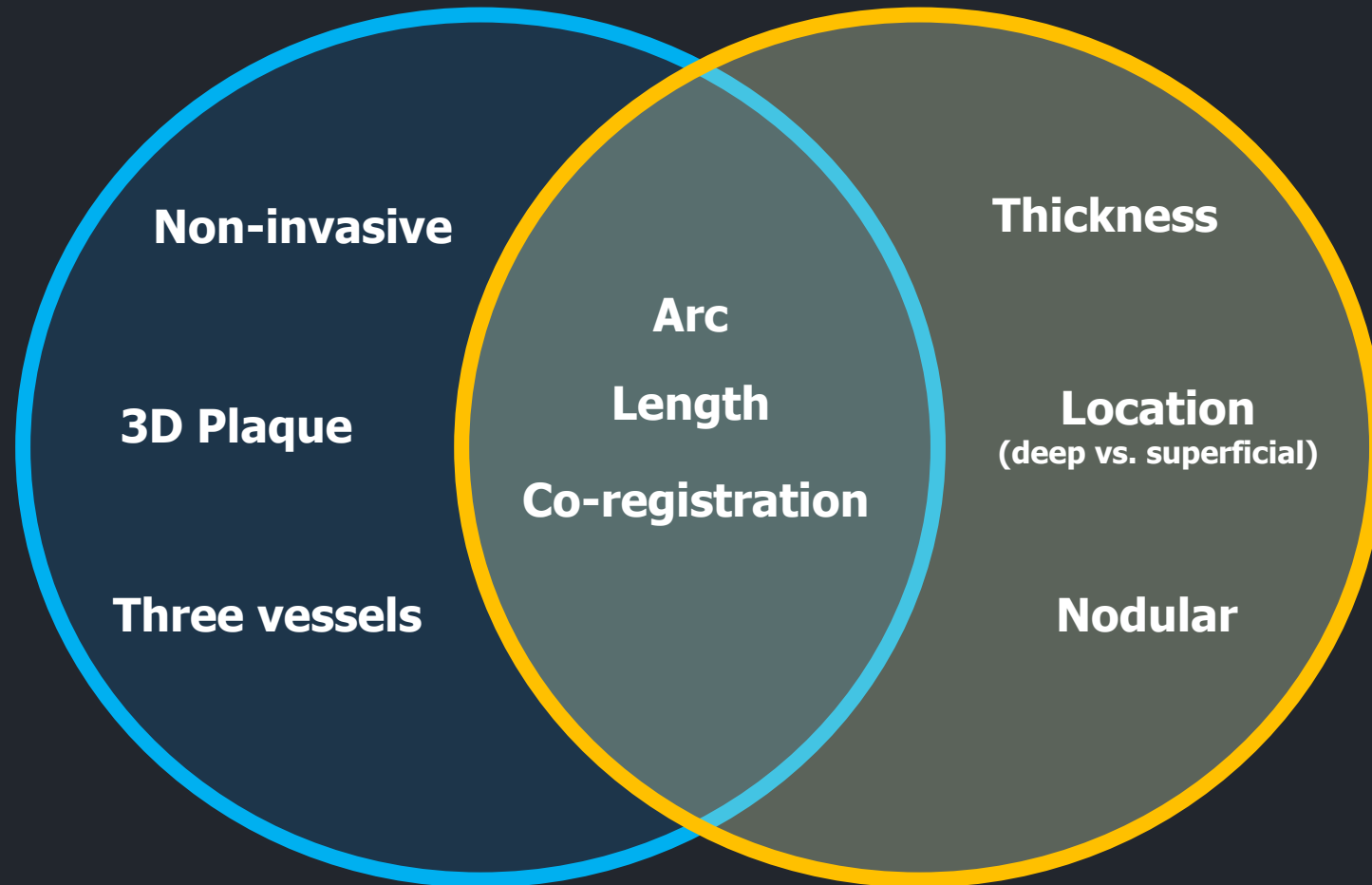
Calcium burden 71%



Imaging Calcium

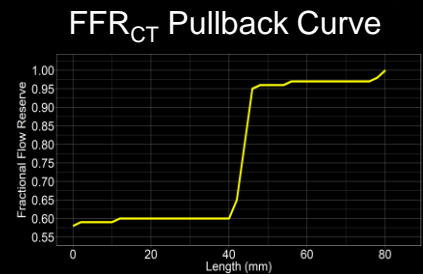
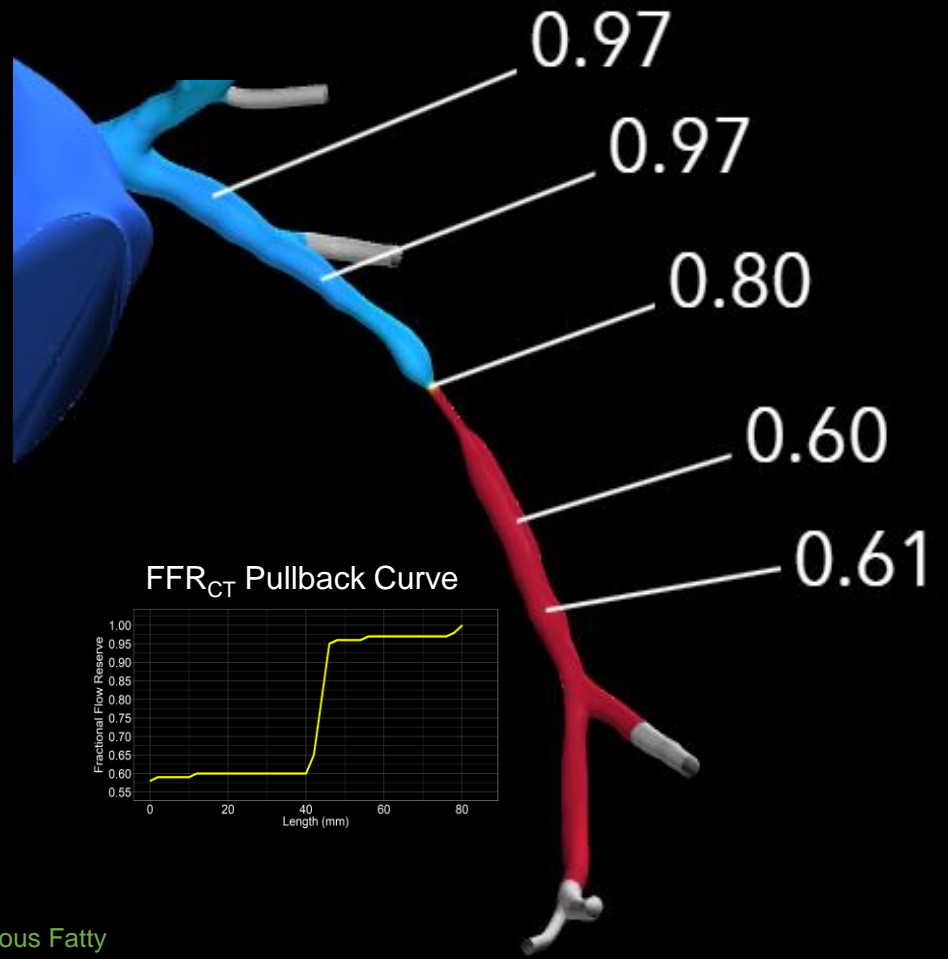
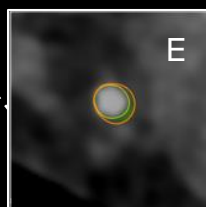
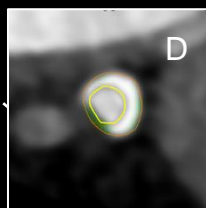
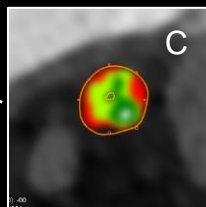
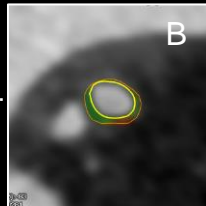
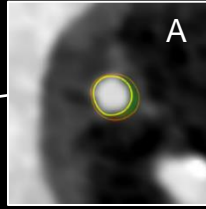
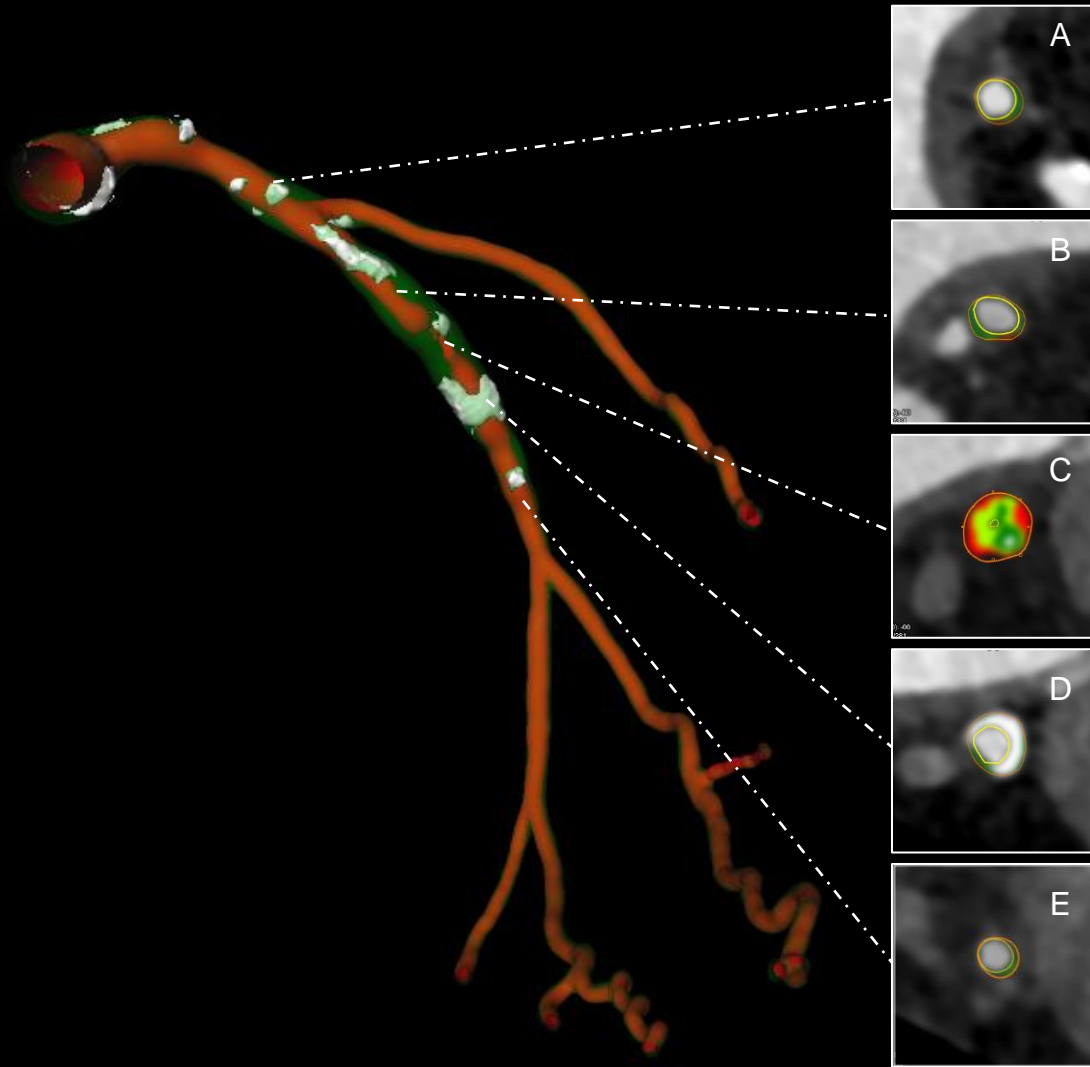
Coronary CT

Intravascular Imaging





CT Guided PCI: Planning



- Fibrous Fatty
- Fibrous
- Necrotic Core
- Calcium

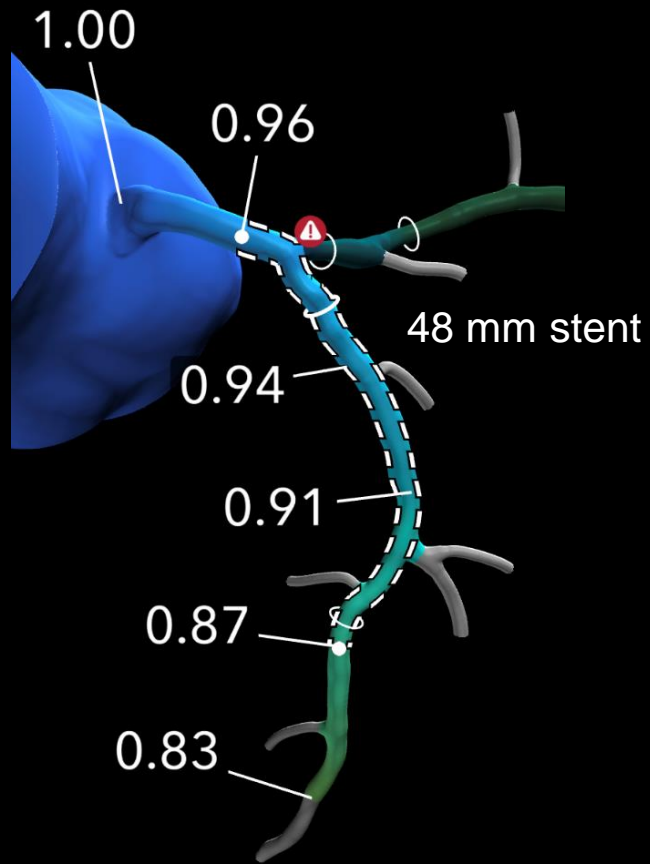


FFR_{CT} Planner

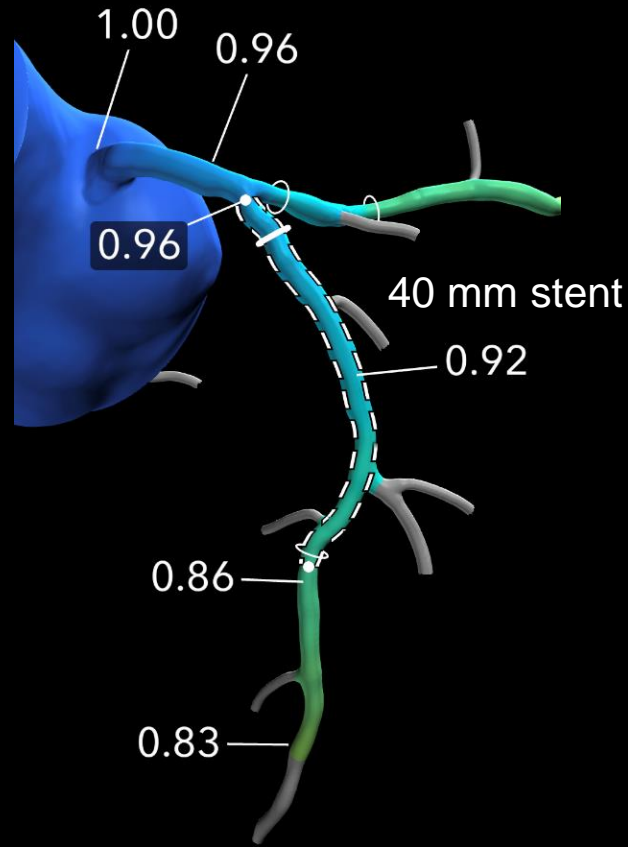
Post-PCI FFR_{CT}



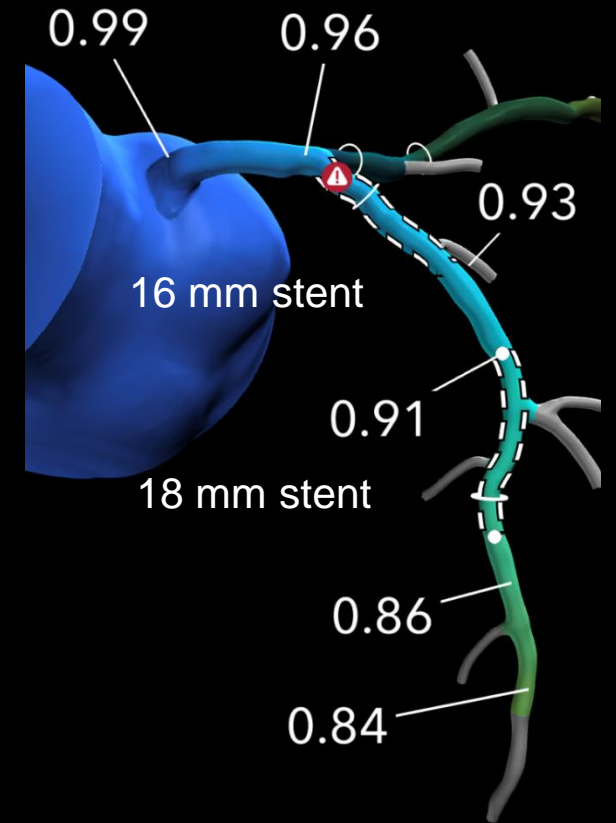
1st Strategy



2nd Strategy

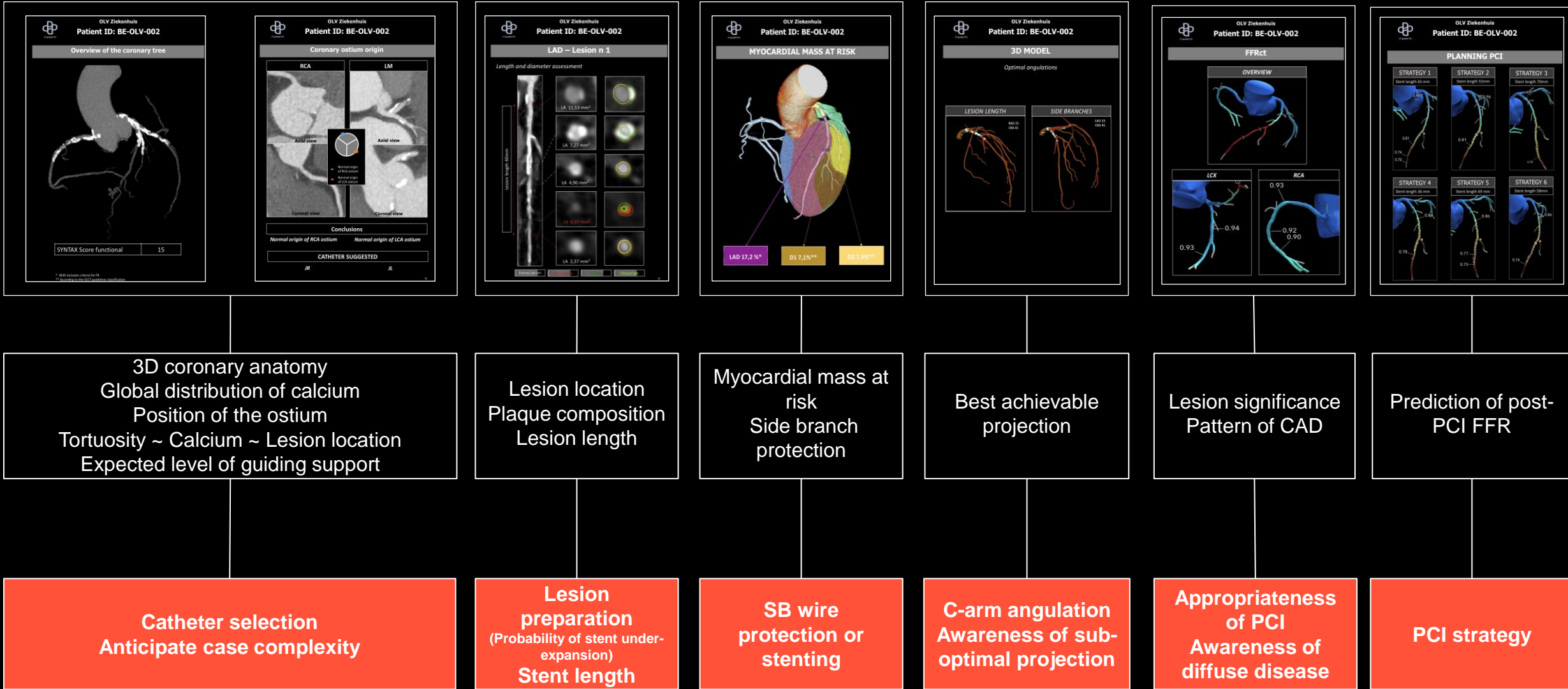


3rd Strategy



PLAN

CT Based PCI Planning





P4 RCT



CT-guided PCI

Patients with stable CAD* (n=1000) with at least one lesion with diameter stenosis >70% and $FFR_{CT} \leq 0.80$

* or stabilized ACS

14 clinical sites in 5 countries (BE, IT, DK, UK and HU)

Centralize Core Laboratory Screening for Eligibility

Key Exclusion Criteria: LM stenosis, STEMI, eGFR <30 ml/Kg, previous PCI in target vessel or CABG, insufficient CTA quality.



PI: Carlos Collet & Daniele Andreini
Chairman: Bernard De Bruyne
Sponsor: CoreAalst BV
Core Lab: CoreAalst BV
CRO: QbD Consulting

CT-guided PCI strategy
FFR_{CT} Planner + Online CT guidance

IVUS-guided PCI strategy
Mandatory pre and post PCI imaging

PCI at operator discretion
Invasive physiology pre and post-PCI recommended

Primary endpoint (non-inferiority)
MACE (cardiac death, target vessel MI and ischemia-driven TVR) between CT- vs. IVUS-guided PCI at 1-year follow-up.

Key secondary endpoint

Radiation dose and contrast volume between CT-and IVUS-guided PCI strategies.
Post-PCI FFR measured immediately after PCI between CT-and IVUS-guided PCI strategies.
SAQ-7 scores between CT and IVUS guided PCI strategies at 12 months.

Hypothesis: A CT-guided PCI strategy is non-inferior to IVUS guided PCI with respect to MACE

Take Home Message

1. Coronary CT allows for procedural **planning** including the assessment of calcification severity.
2. The addition of FFR_{CT} informs about CAD patterns (focal vs. diffuse) and allows for **predicting** the results of PCI.
3. The integration of coronary CT in the cath-lab provides **online guidance** with plaque visualization in 3D in the complete coronary tree.