CT-Directed PCI:

Bridging Anatomy, Physiology, and Patient Management

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Question 1: In your current practice, how do you primarily view Coronary CTA?

a) A "gatekeeper" to rule out significant disease in low-risk patients.

b) A helpful tool to see anatomy, but not for planning the actual procedure.

c) A vital "blueprint" that I use to design the interventional strategy.

d) Not currently a regular part of my clinical workflow.

Question 2: How confident are you that angiography alone reliably defines lesion length and disease extent?

a) Very confident

b) Somewhat confident

c) Neutral

d) Uncertain

CT Directed PCI: Why This Matters Now

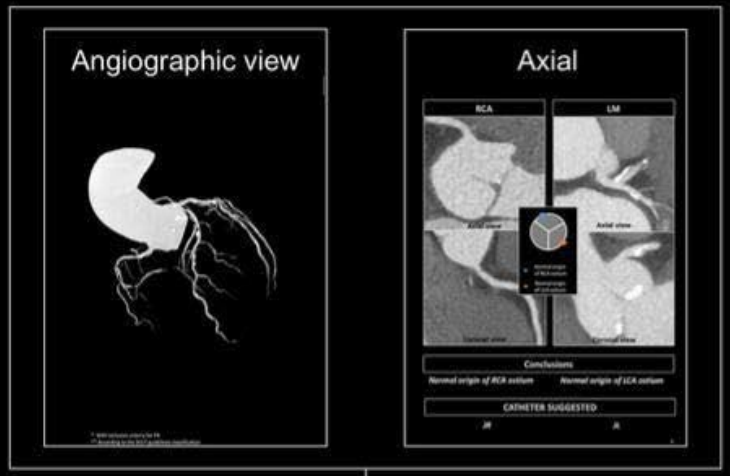
- **CCTA** is well established for *diagnosis* of CAD, with strong guideline endorsement and prognostic value

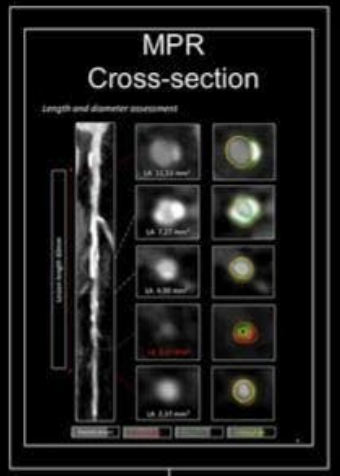
- PCI planning traditionally remains **angiography driven and ad hoc**, leading to:
  - Operator variability
  - Intra procedural decision pressure
  - Inefficient resource utilization

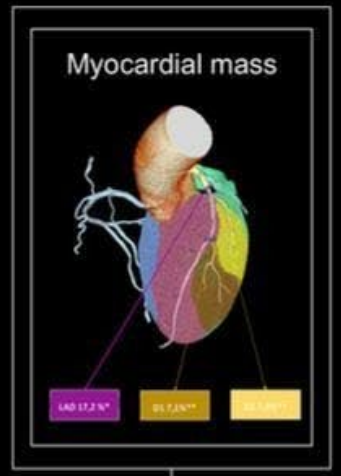
The Rationale – Closing the “Ad Hoc” Gap

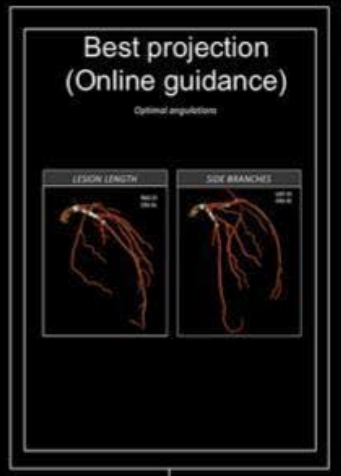
- **The Paradigm Shift**: CT guided PCI introduces a planned PCI paradigm, shifting key decisions to a pre procedural phase using CCTA
  - From *reactive → planned PCI*
  - From *lesion-centric → patient-centric*
  - From *in-lab decisions → pre-procedural strategy*
- **The Goal**: Use CCTA as a decision-support platform to determine **whether, what, and how** to treat before entering the cath lab

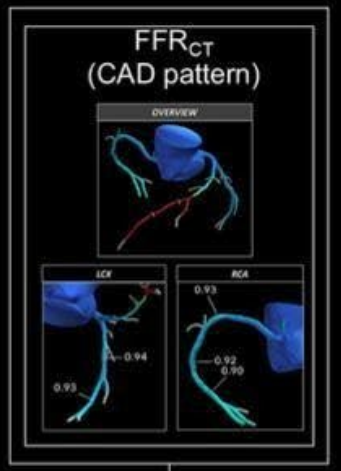
CT-guided PCI
From Diagnosis to Procedural Strategy











3D coronary anatomy Global calcium distribution Ostial position Tortuosity ~ Calcium ~ Lesion location Expected level of guiding support	Lesion location Plaque composition Plaque distribution Lesion length	Myocardial mass at risk Side branch protection	Best achievable projection	Lesion significance Pattern of CAD	Prediction of post-PCI FFR
Catheter selection Anticipate case complexity	**Lesion preparation Stent length**	**Side-Branch protection Strategy**	**C-arm angulation Awareness of sub-optimal projection**	**Appropriateness of PCI Awareness of diffuse disease**	**PCI strategy**

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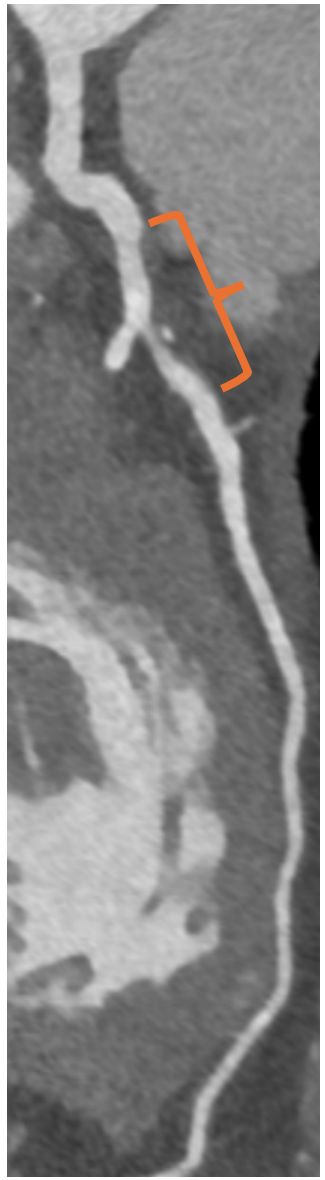
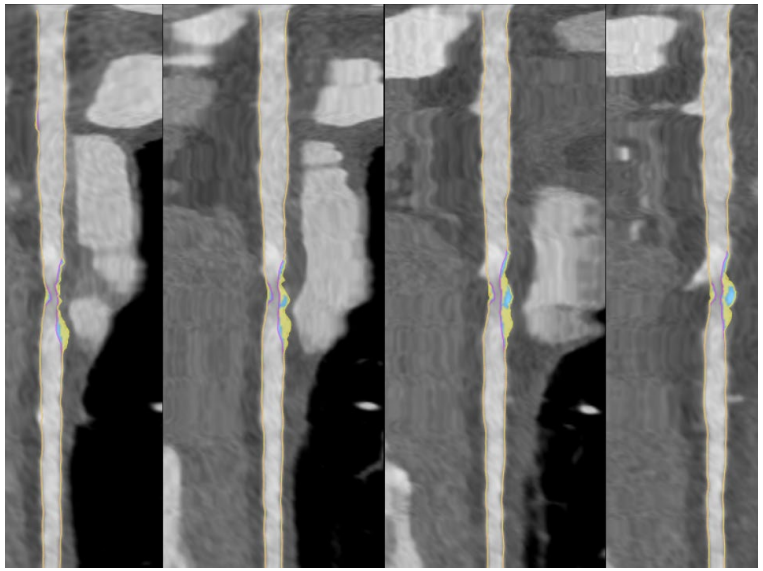
Management – The "Heart Team 2.0" Workflow

- **Enhanced Triage**: Data-driven case assignment to appropriate operators and locations based on predicted complexity
- **Multidisciplinary Collaboration**: Fosters a "convergence of specialties" where imagers and interventionalists collaborate on a unified procedural roadmap
- **Standardized Planning**: Shifts key decisions—strategy for bifurcations, CTO wiring, and device needs—to the pre-procedural phase
- **Shared Decision-Making**: Uses 3D models to improve patient understanding and informed consent

Case 1

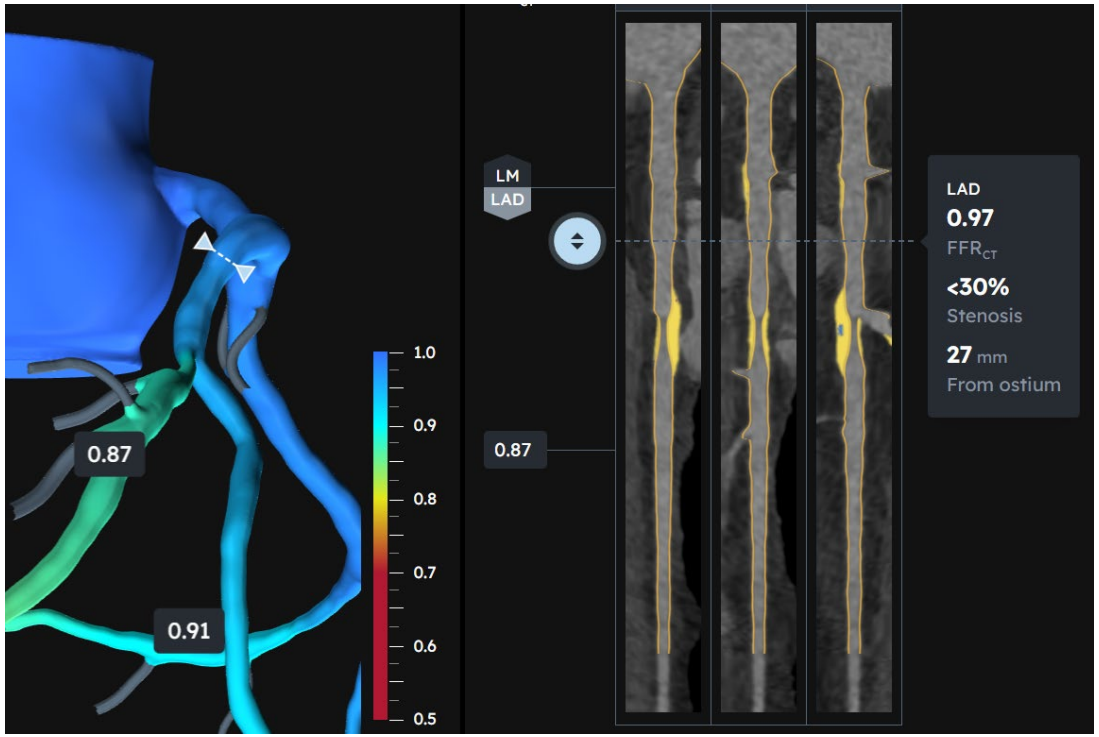
- 67y/o Male, exertional chest pain, typical angina symptoms, 15-20 mins duration, several years
- GXT ischemic changes
- Calcium score: 15.4 in LAD
- Nuclear SPECT: normal perfusion 2 years prior

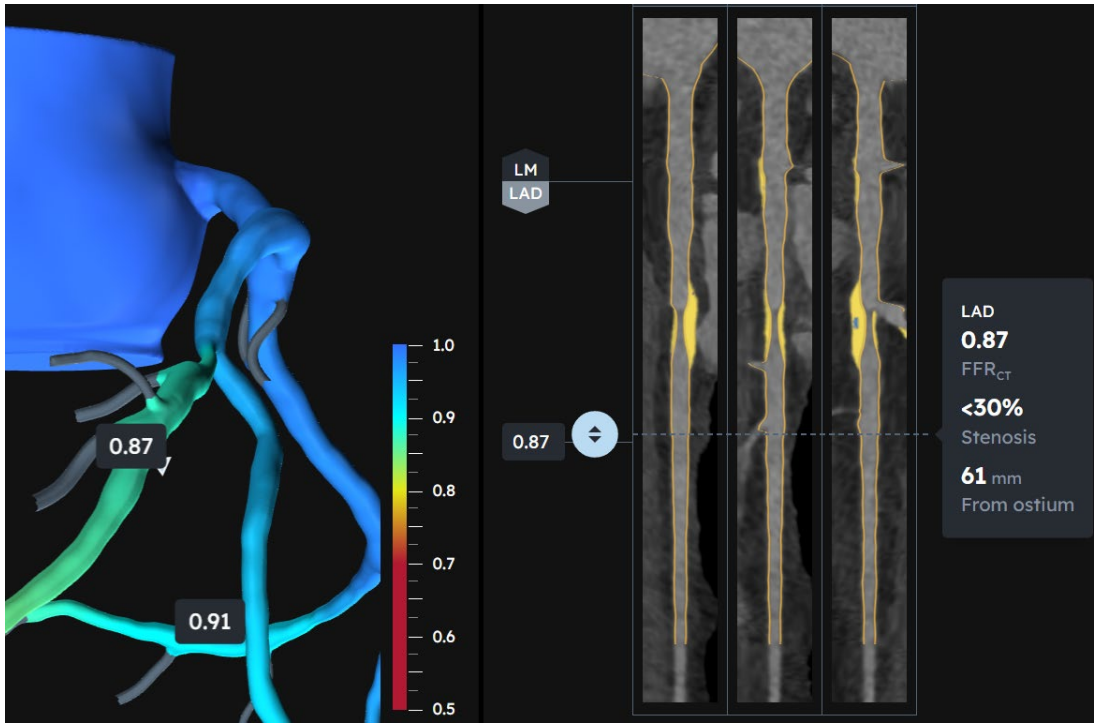




CCTA: Calcium score: 26.4
Proximal to mid LAD stenosis: visually 70-80%, quantitative 65%

Case 1: FFR-CT and Delta FFR

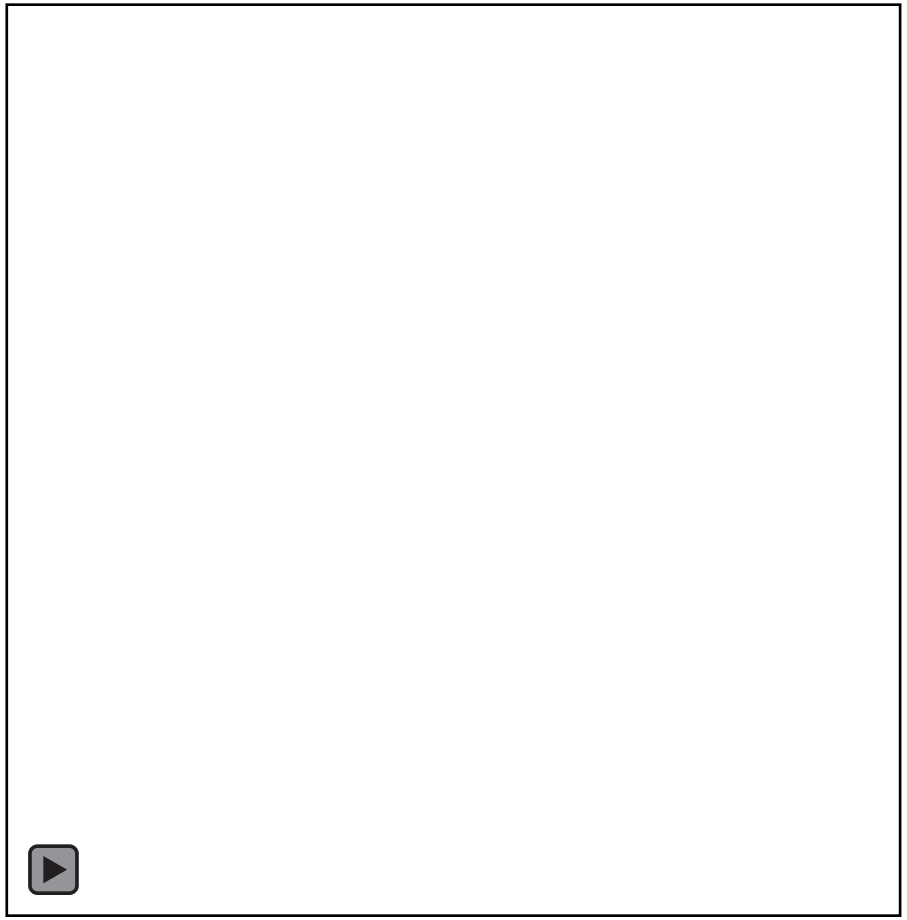


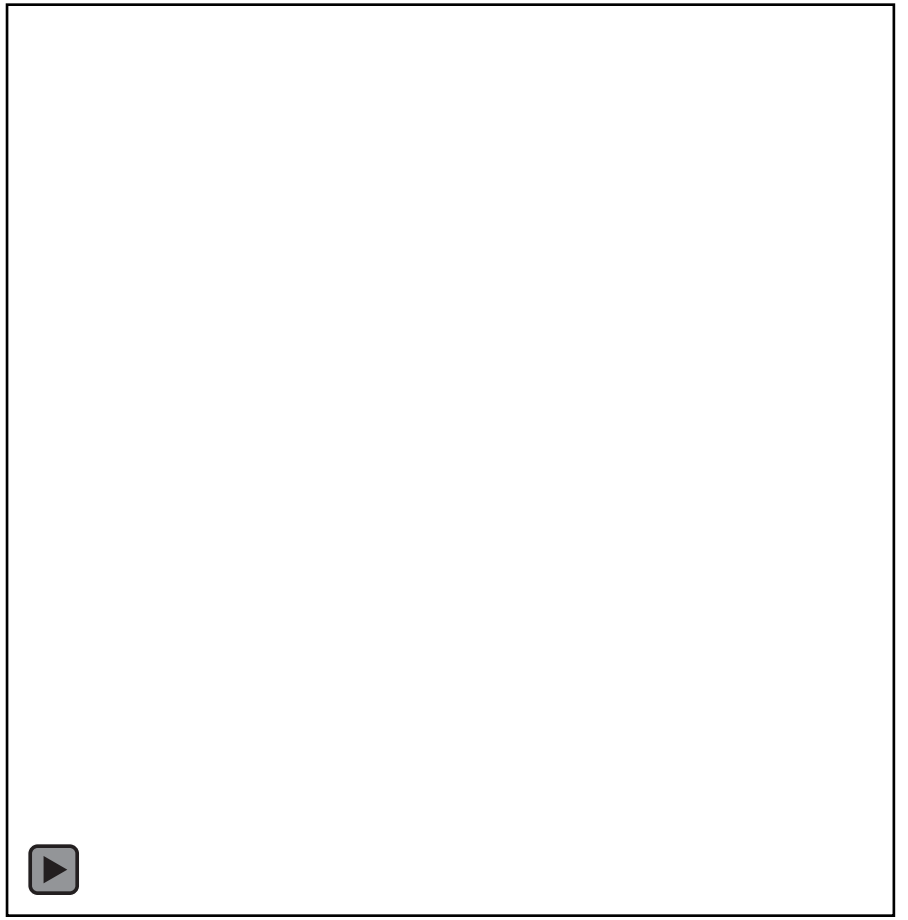


- **FFR CT distal to stenosis: 0.87; Delta FFR: 0.10**

- **Delta FFR** depicts difference between the values before and after a specific narrowing.
- **Cut-off Value**: A drop (≥ 12-13) is generally considered a strong predictor of hemodynamically significant disease. Recent studies with PCCT use a lower threshold of ≥ 0.06.
- **Predicting Treatment:** A high Delta is an independent predictor for needing early revascularization

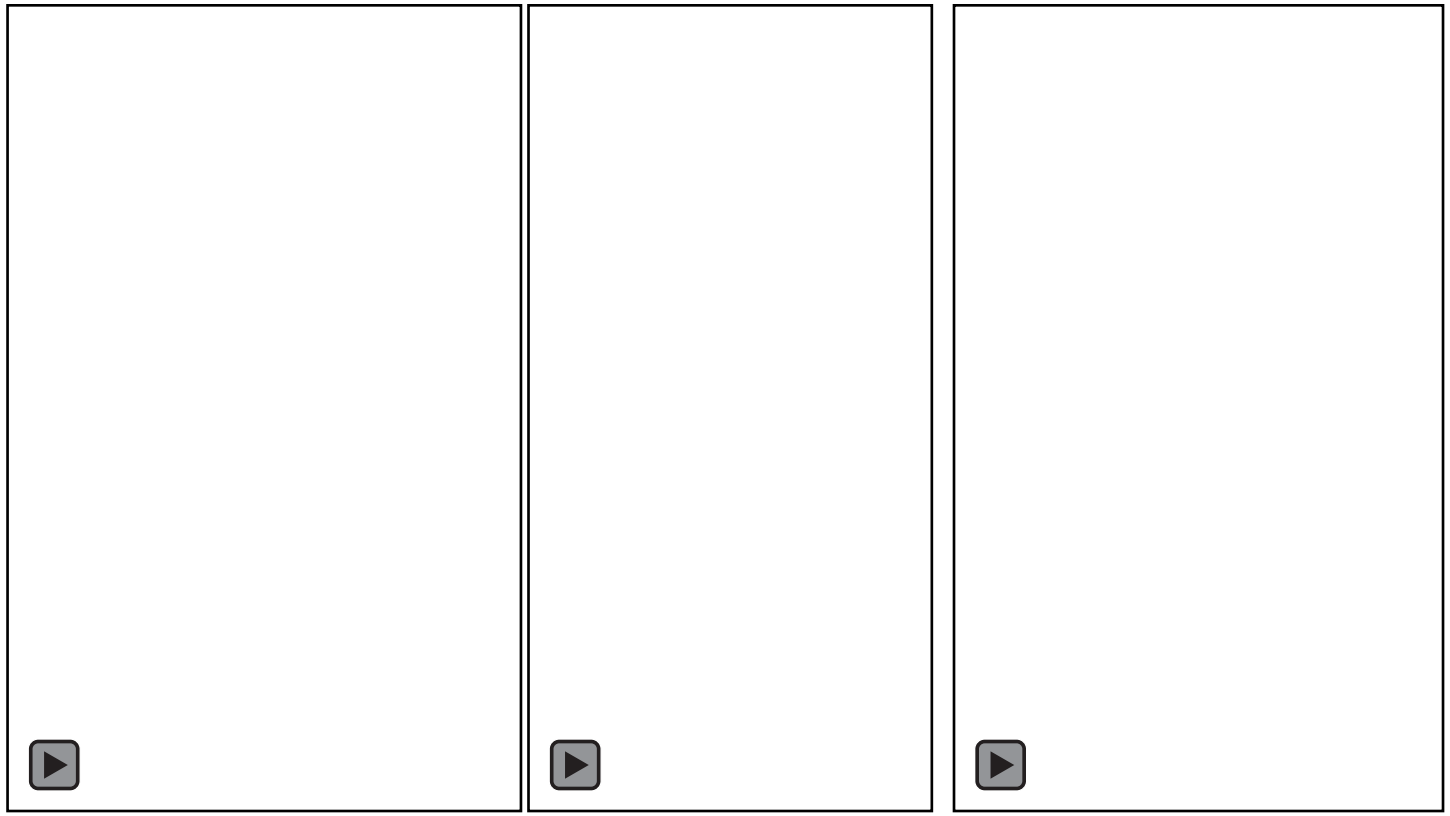
Case 1: LHC, Invasive Hemodynamics, PCI with IVUS





- **LHC**: mLAD 80-90% stenosis
- **RFR**: LAD 0.77
- **IVUS pre**: high grade lipid rich plaque with minimal calcification in mLAD with moderate stenosis proximal and distal to lesion
- **PCI LAD**: DES 3.0x22mm post balloon dilatation
- **IVUS post**: Post Minimal stent area: 6.8 sq mm with greater then 95% expansion, no edge dissection

Case 2

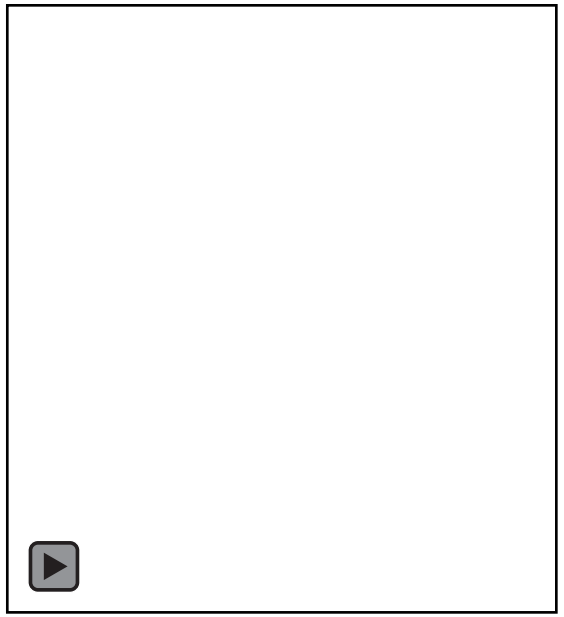


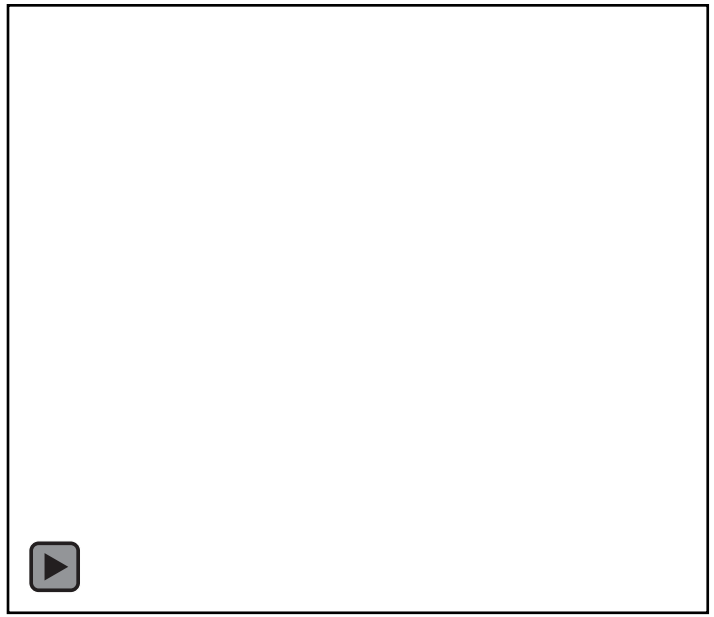
- 67 y/o male, exertional chest pain

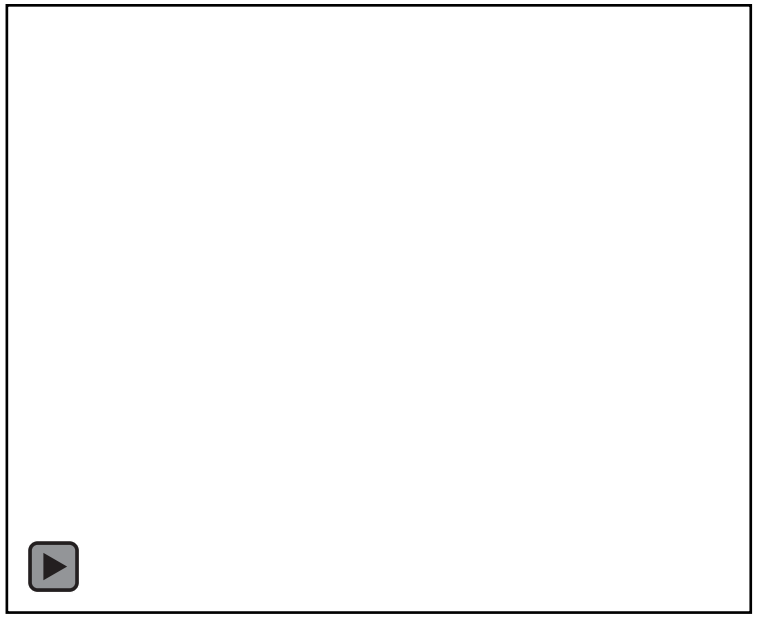
CCTA

- Agatston calcification score is 52
- Severe stenosis of 88% in the LAD.
- Severe stenosis: 79% in the LCx.
- Moderate stenosis: 50-69% RCA

Case 2: LHC







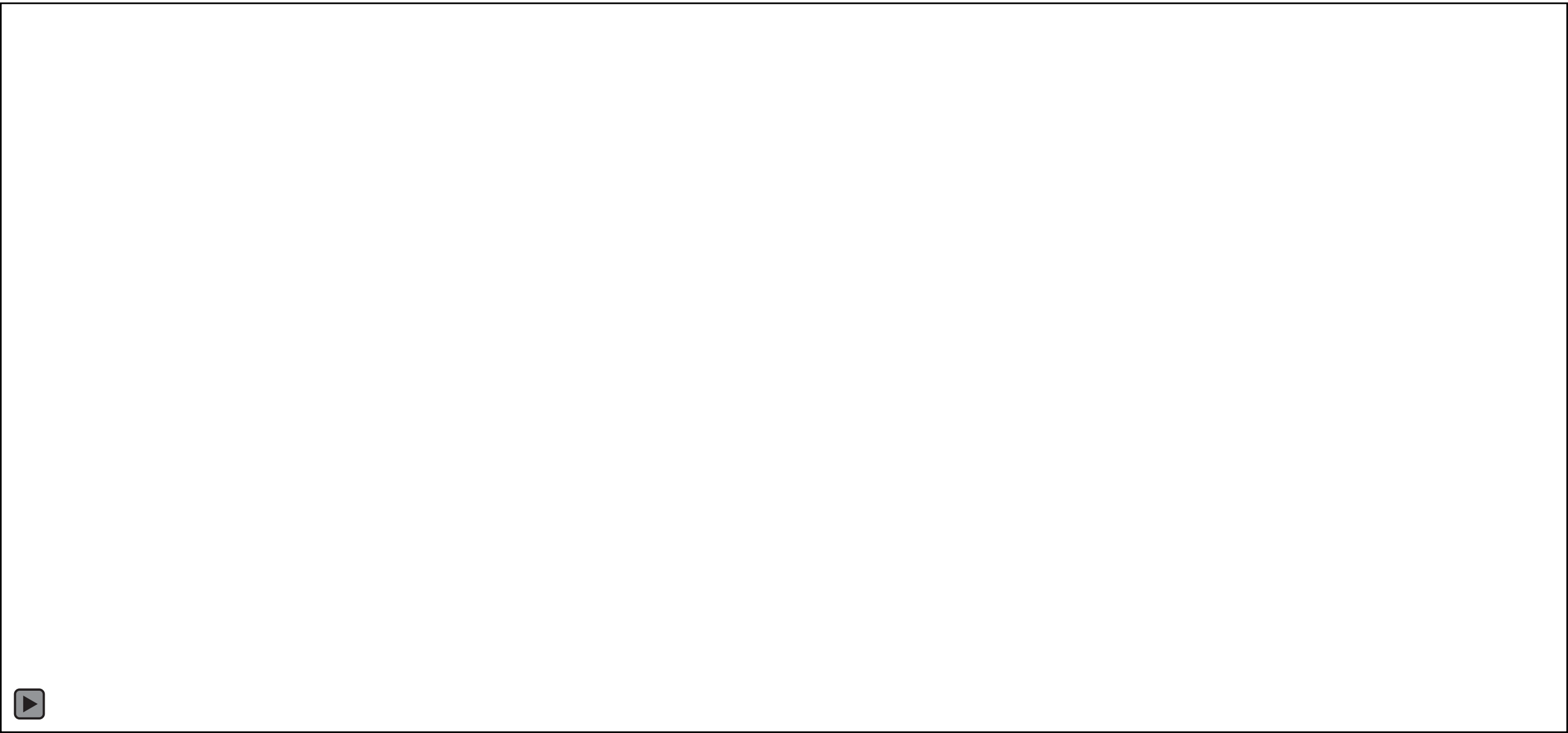
- mLAD: 90% stenosis.
- Lcx ostial 80%.
- pRCA: 70% stenosis

- CABG evaluation

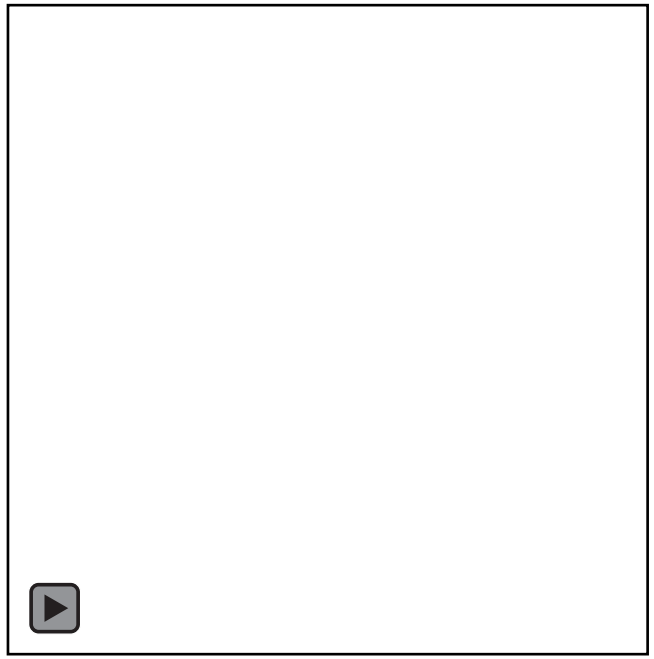
LAD

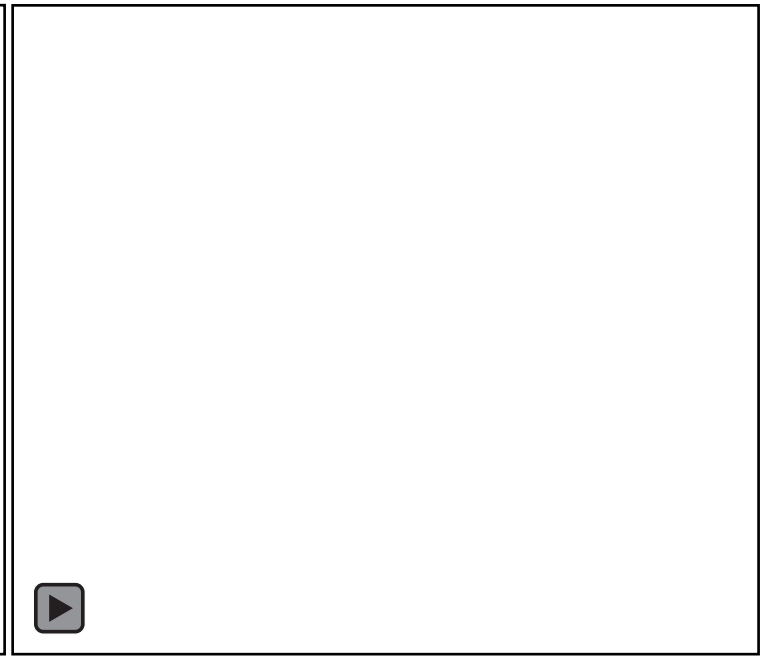
LCx

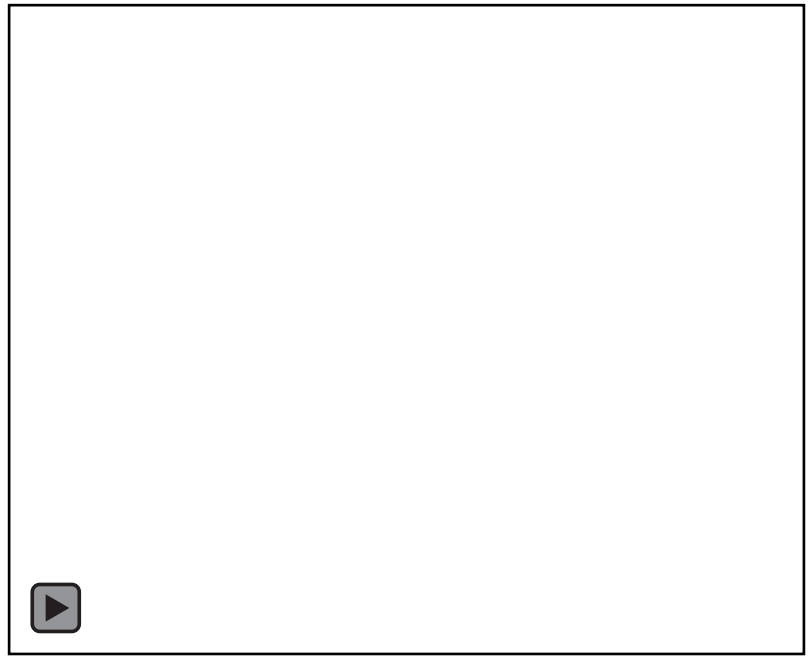
RCA



Case 2: PCI

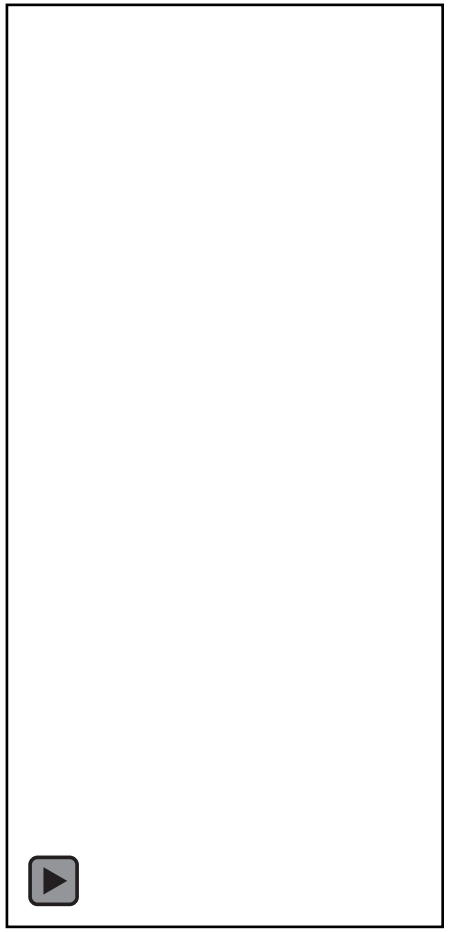






- IVUS guided procedure, pre and post dilatation.
- PCI RCA 4.0 x 22mm DES
- PCI LAD 3.5 x 38mm DES. Step down was noted at the distal stent edge. Accordingly, a 3.0 x12mm DES was placed distal to the previous stent.
- PCI LCx 3.5 x 30mm DES.

Case 3

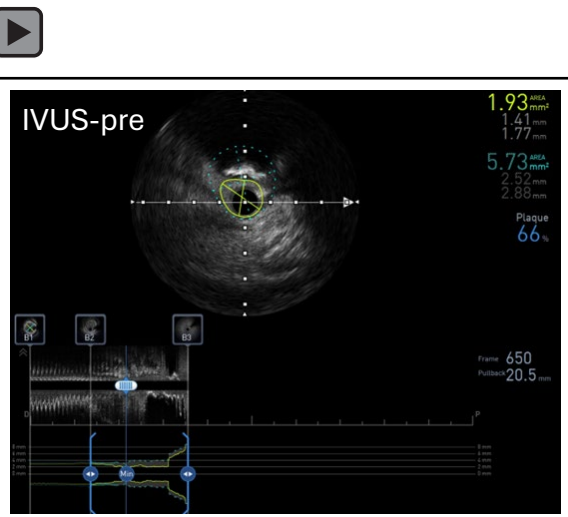


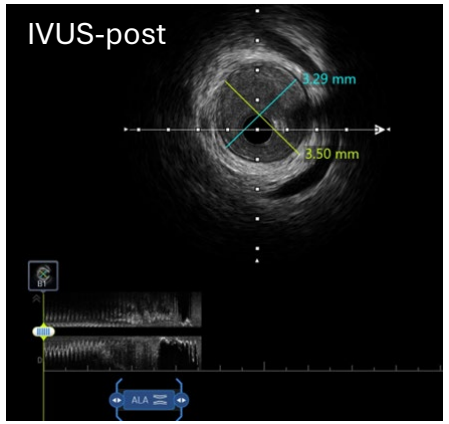
- 79 y/o F, left sided shoulder pain radiating to chest wall

CCTA

- Agatston calcification score is 350
- Severe stenosis of 70-99 % in the ostial/pRCA.
- Severe coronary calcification in the ostial/proximal RCA segment

LHC, PCI





- Lithotripsy facilitated PCI of heavily calcified 80% ostial RCA stenosis, 3.5x22mm DES

Question 3: What do you see as the biggest potential benefit of CT-Directed PCI for your patients?

a) Shorter procedures with less radiation and contrast.

b) More predictable outcomes in complex cases (LM, Bifurcations, CTOs).

c) Better shared decision-making by showing the patient their 3D heart model.

d) Avoiding "unnecessary" invasive angiograms that don't lead to intervention.

Key Take-Home Messages

- CT-directed planning works best not as a replacement, but as a common language between imagers, interventionists, cardiologists and patients.

The question is no longer if CT belongs in PCI planning—it's how thoughtfully we choose to use it.