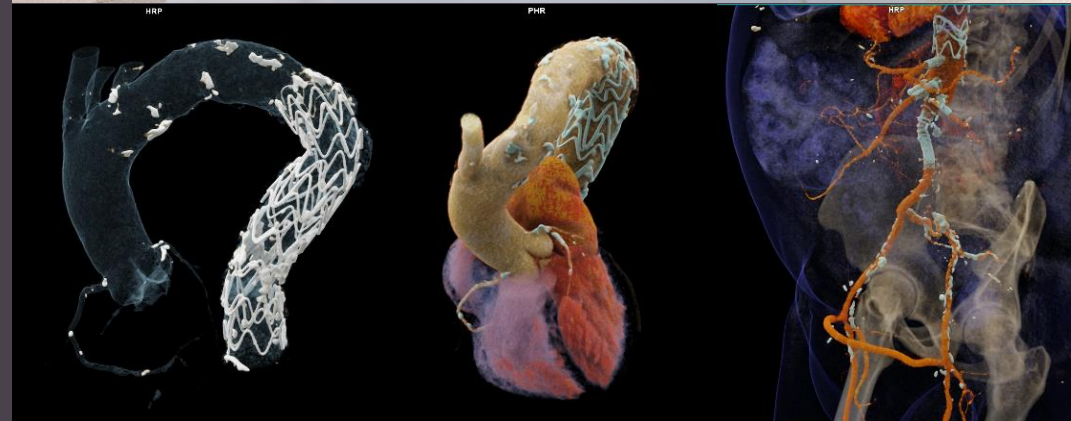


AMICALE DE CARDIOLOGUES DE LA
CÔTE D'AZUR
Nice

Mardi, 6 décembre 2022

► Filippo CIVAIA & Philippe ROSSI



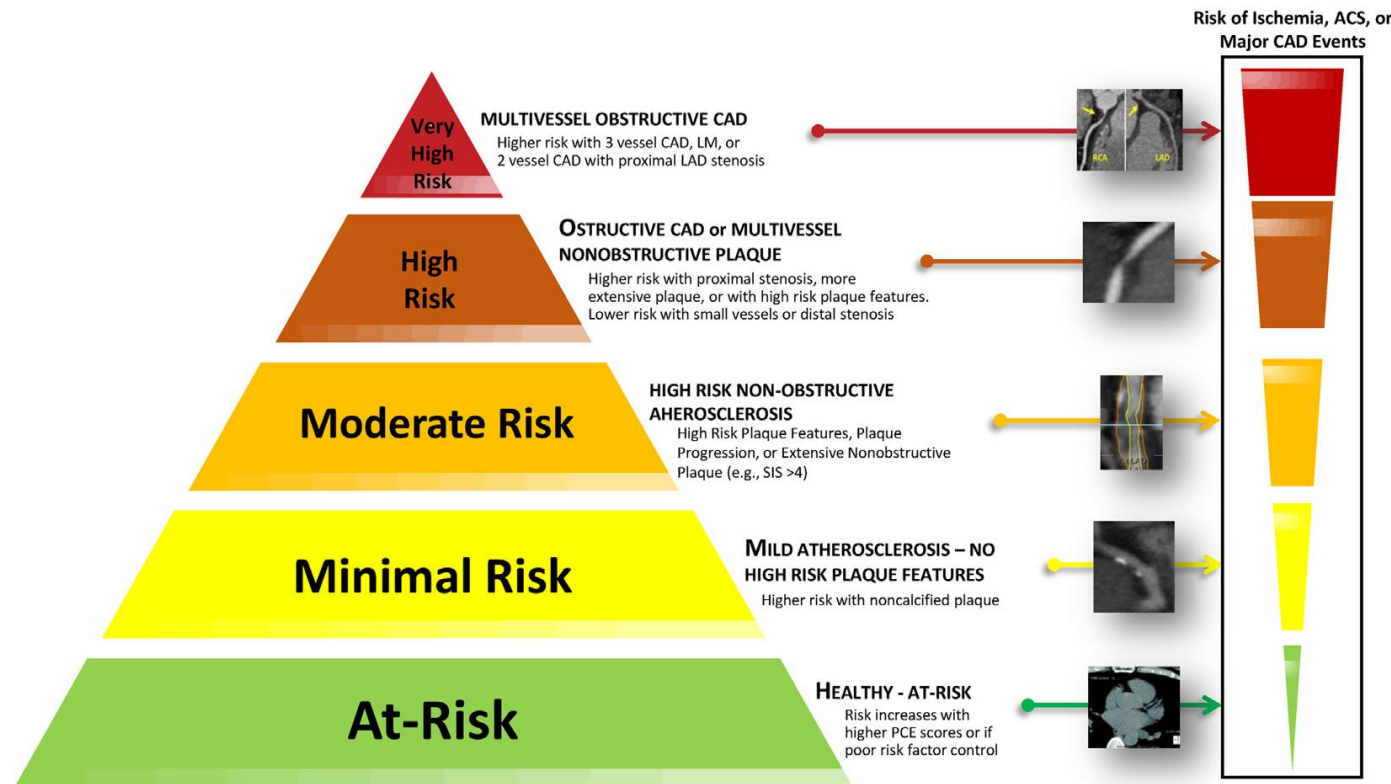
Classic anatomical approach

Normal or abnormal with mild-moderate-severe stenosis

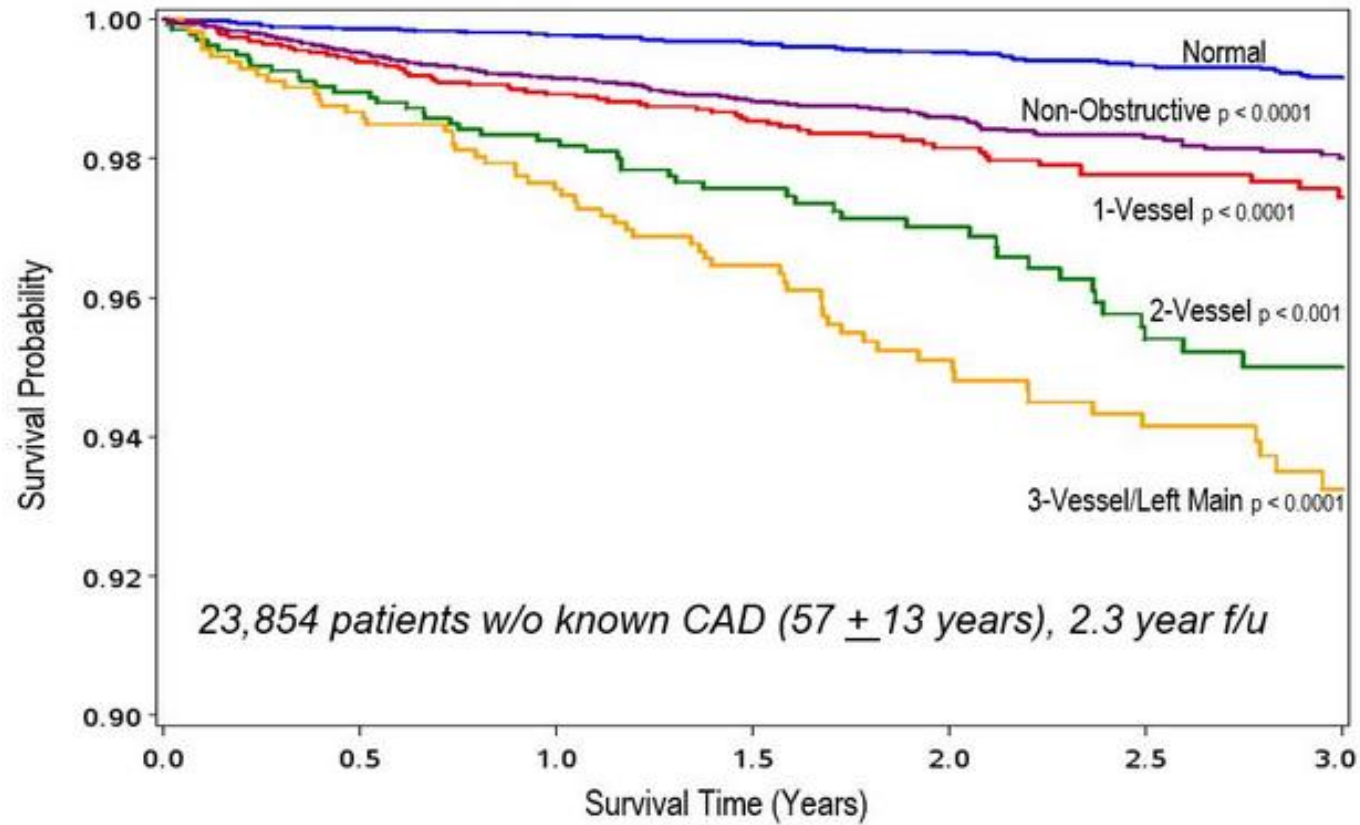


Traditional risk assessment

Presence and extent of ATS plaque elevate the risk above pts without any documented plaque



Traditional risk assessment



HRP: expanding view point

- Most cardiac events occur without any preceding symptoms
- Two-third of AMI are caused by rupture of vulnerable plaque
- Is crucial to identify the « vulnerable plaque » or HRP in *asymptomatic patient*

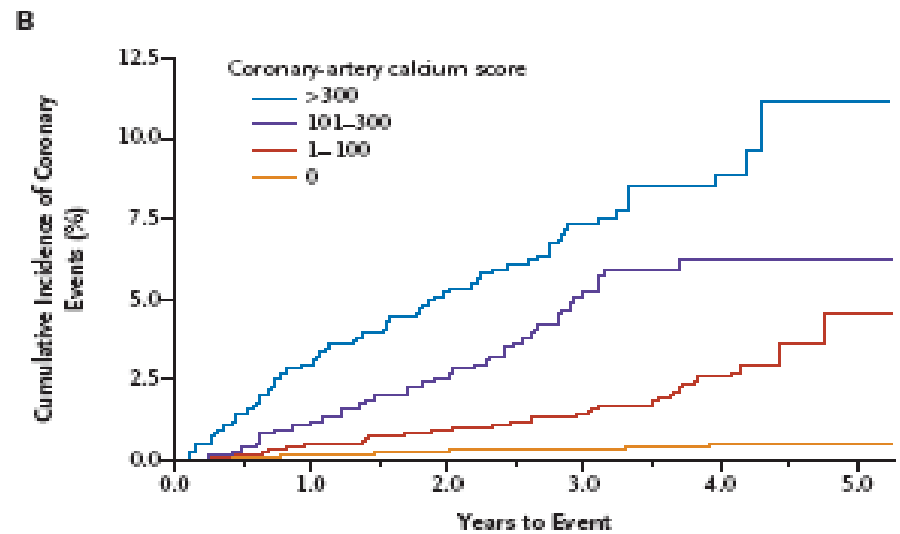
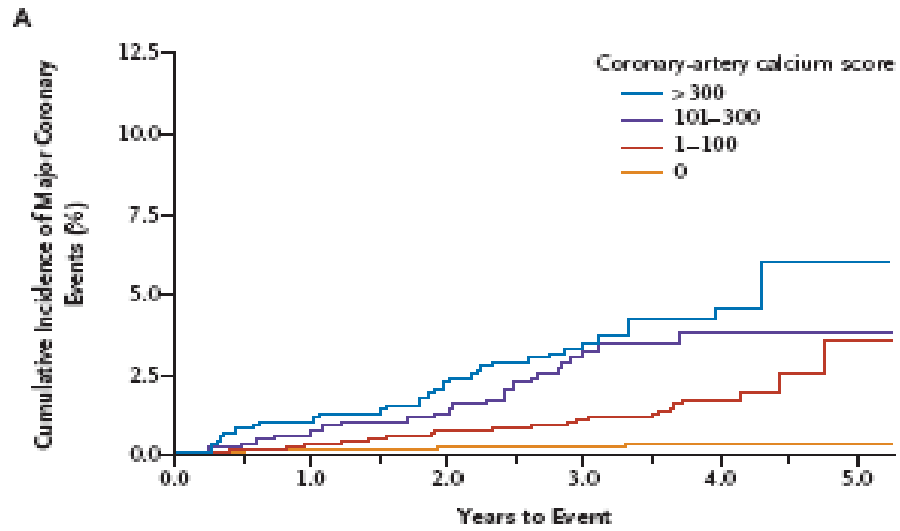
Plaque burden (HRP) high risk plaque



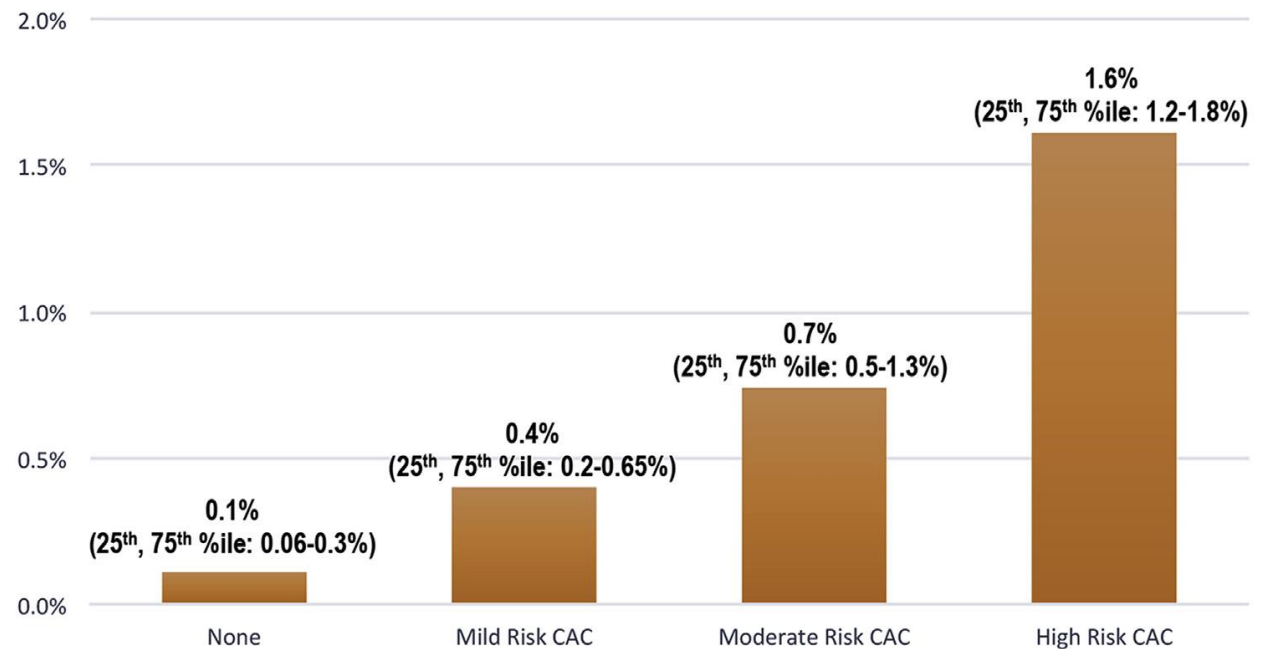
Recent prognostic approach

- Describing plaque features
- Correlation with MACE
- Plaque imaging to direct risk-reducing
- Initiation and intensification of prevention using CTA

CAC



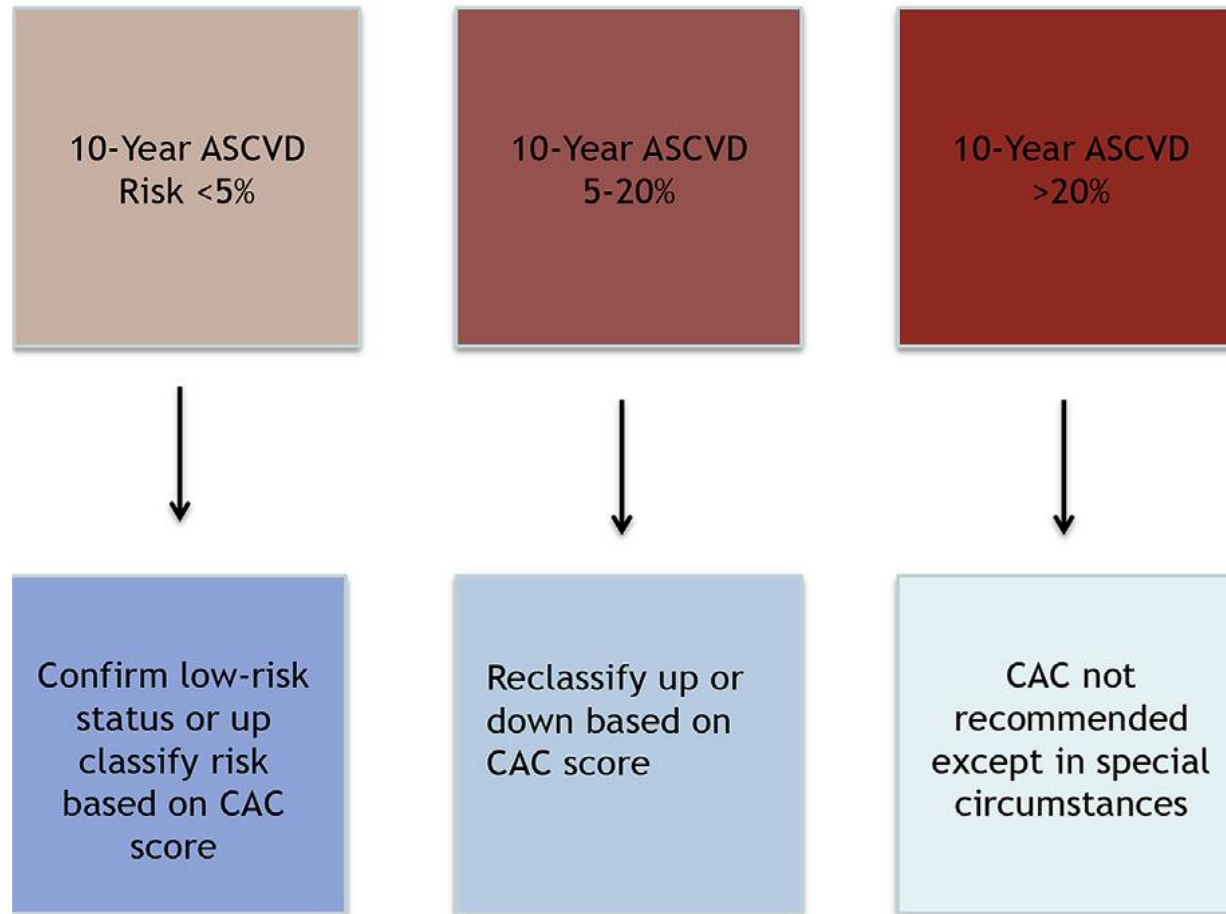
NEJM and SCCT statement



Risk classification and treatment in 5-20% ASCVD risk group

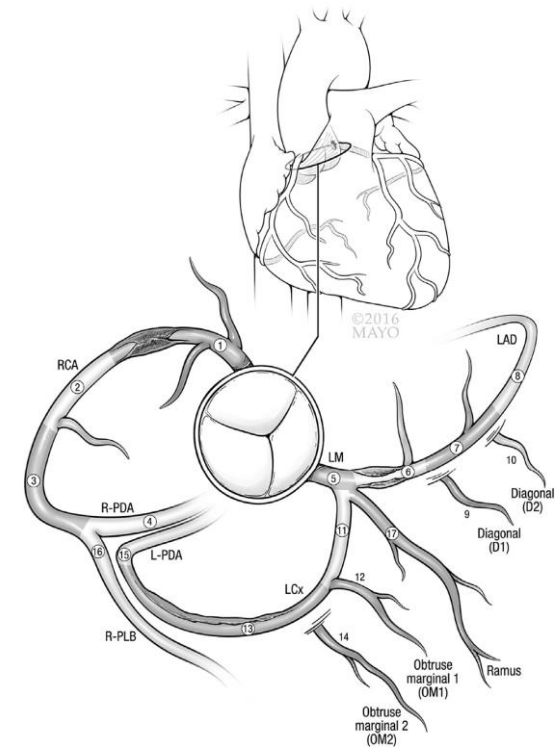
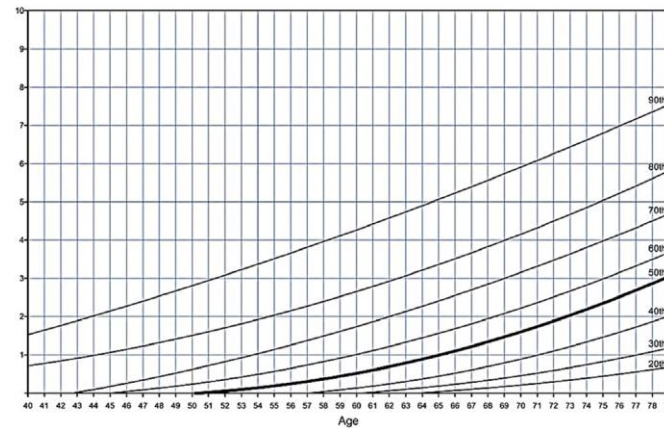
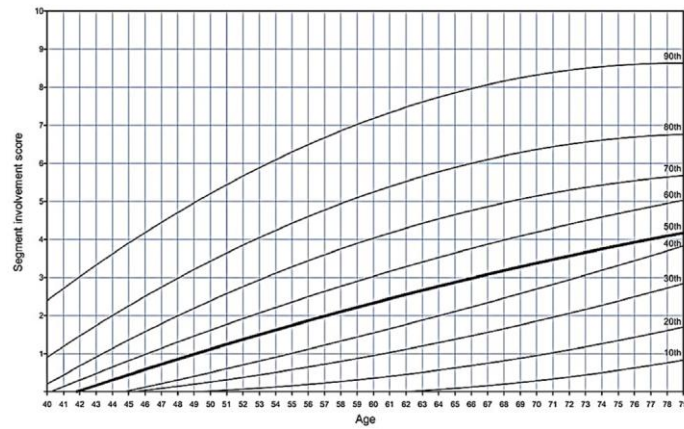
Score	Risk	Treatment recommendation
0	Very low	Non
1 - 99	Mildly increased	Moderate intensity statin
100 - 299	Moderately increased	Moderate to high intensity statin + ASA 81 mg
> 300	Moderately to Severely increased	High intensity statin + ASA 81 mg

CAC: role in guiding treatment in the 10 year risk categories

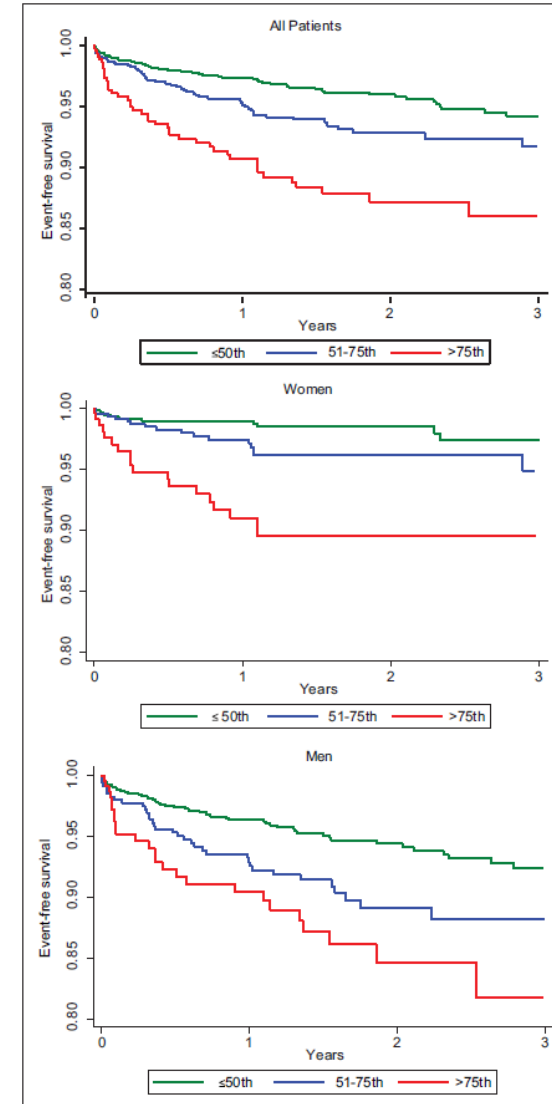
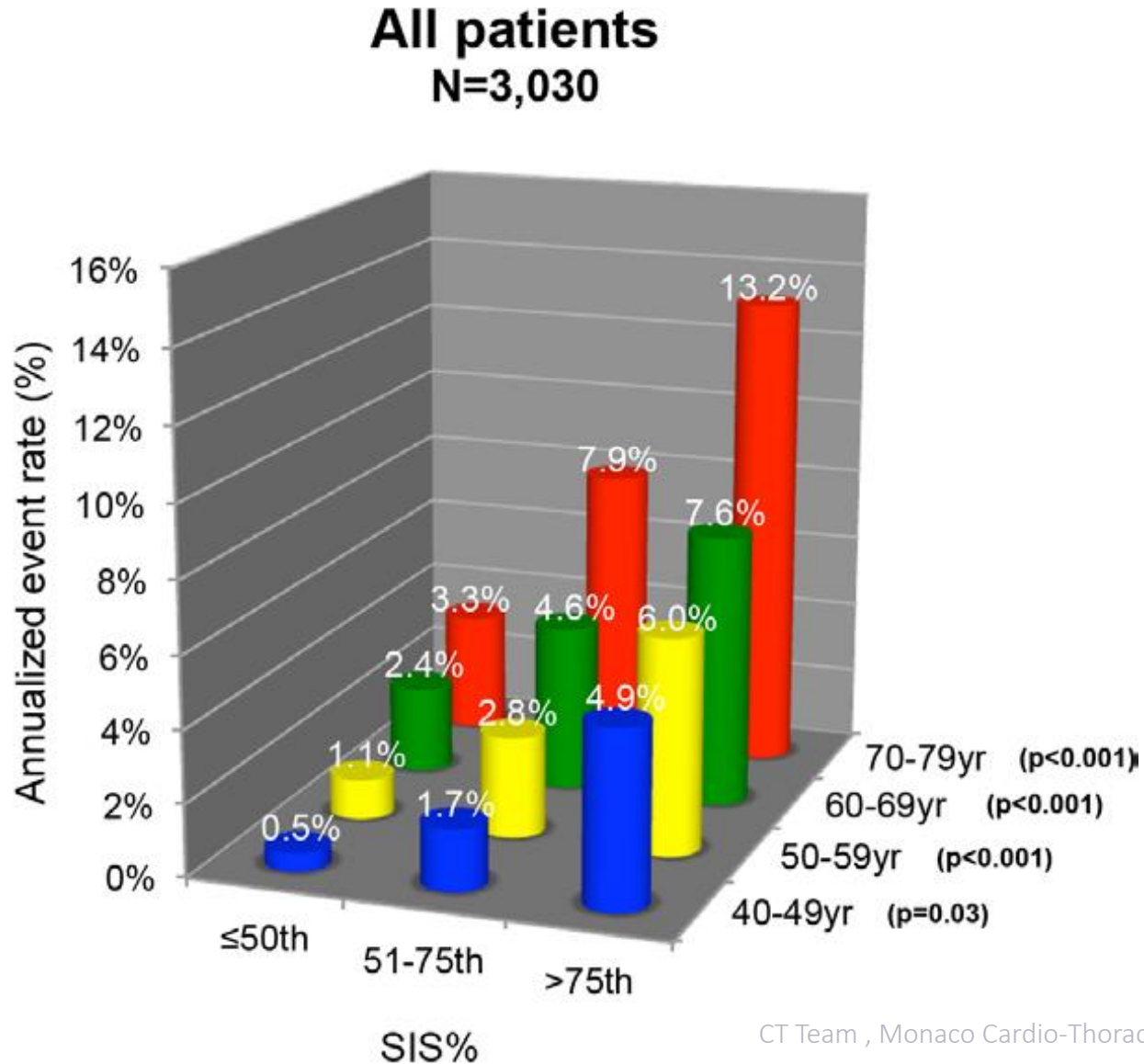


SIS score

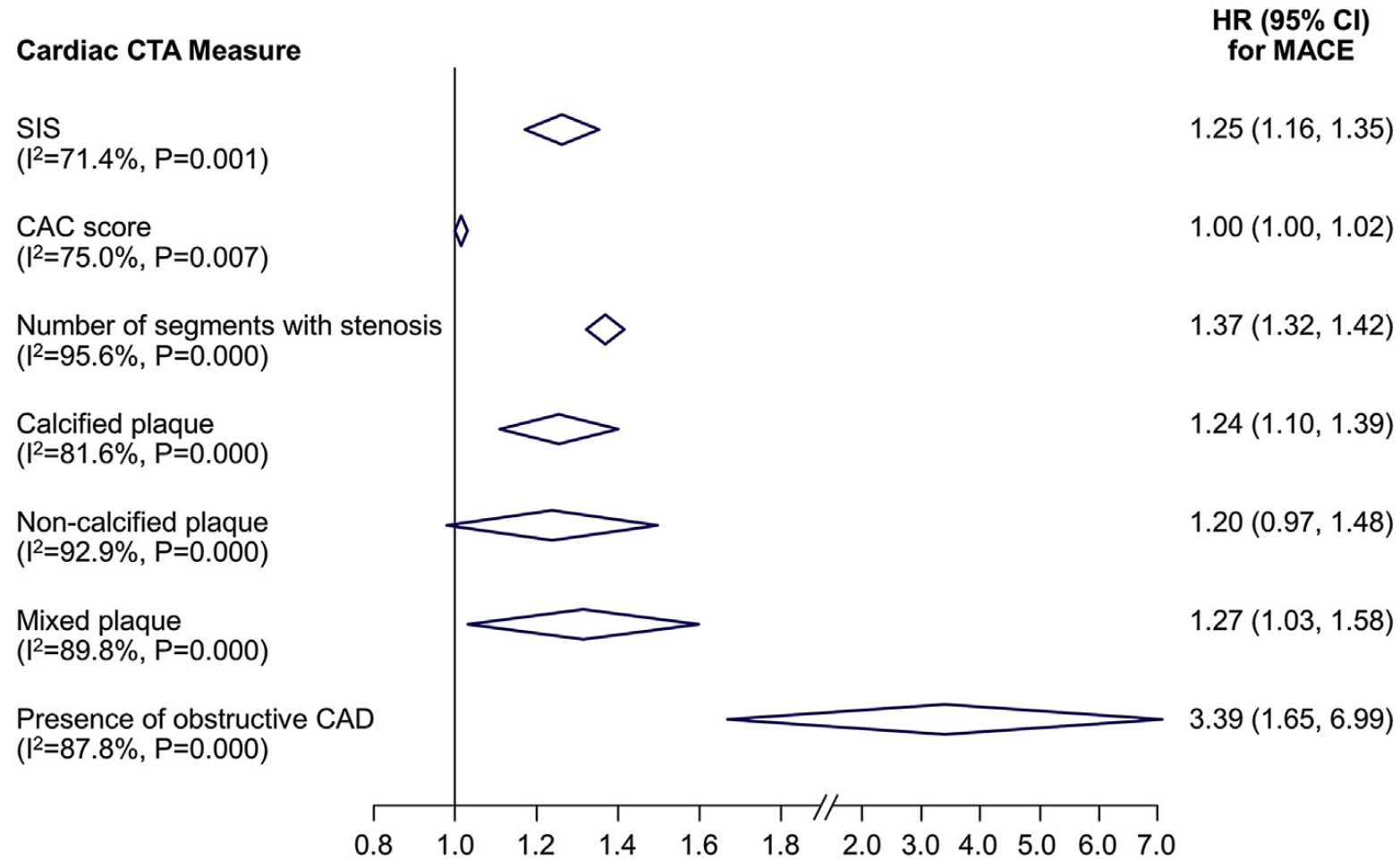
- Use semi-quantitative SIS (*segment involvement score*)
- SIS score > 5 elevated risk



SIS score

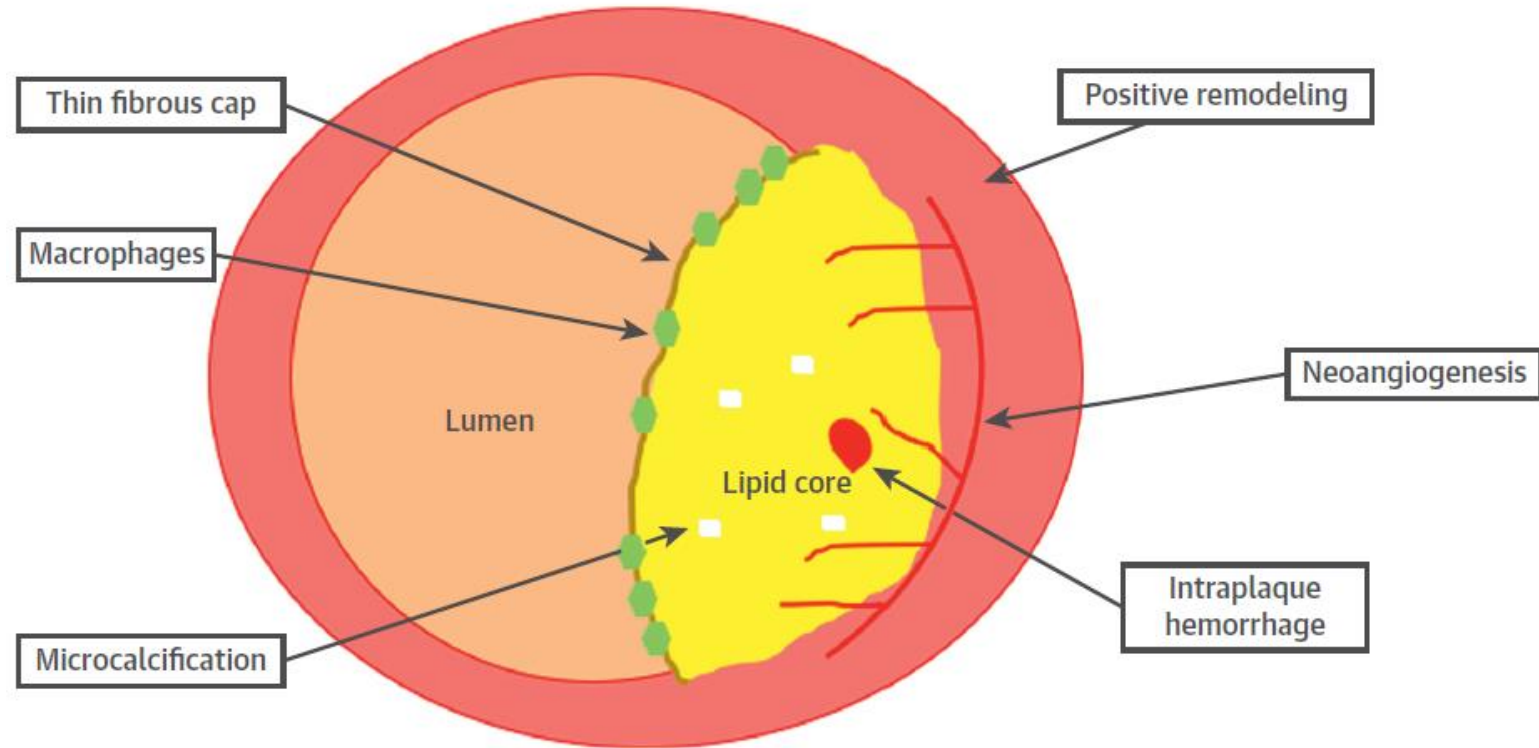


SIS score



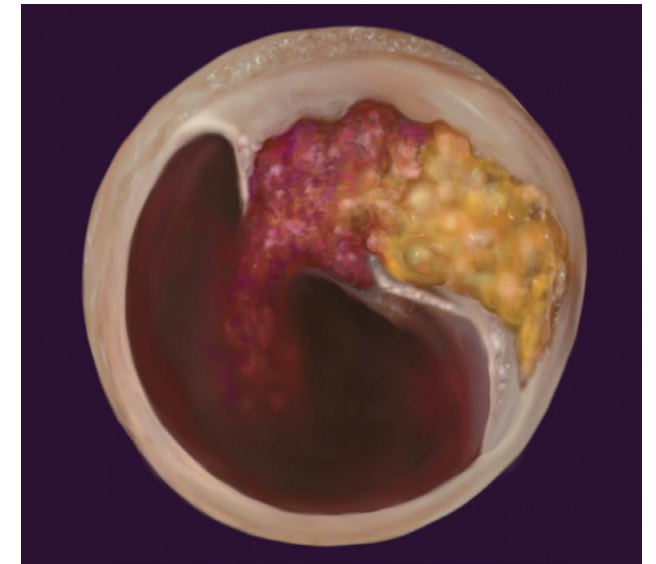
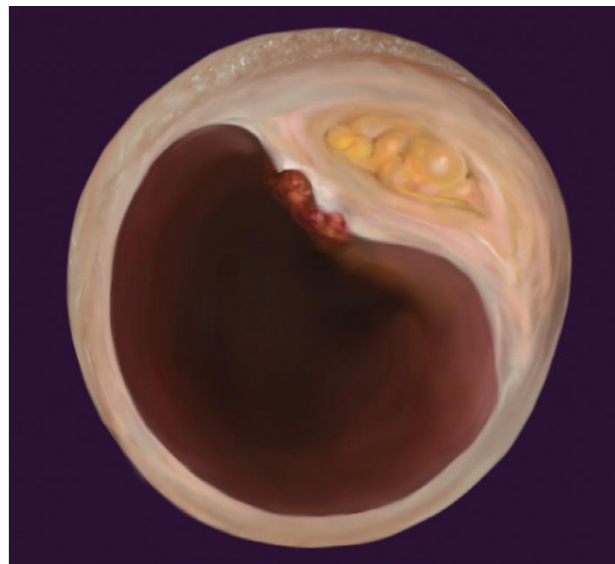
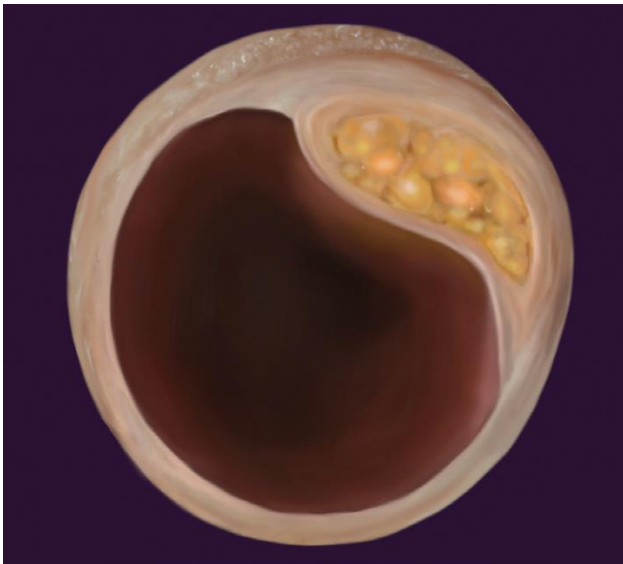
HRP: Imaging target

- Macrophage accumulation
- Large lipid core
- Positive remodelling
- Thin fibrous cap
- Microcalcification
- Intraplaque hemorrhage
- Plaque destabilization



Vulnerable plaque contrast with fibro-calcified plaque of stable angina

HRP: thin cap fibroatherome (TCFA) with large plaque burden , a lipid core, positive remodelling, and macrophage infiltration



Positive remodelling

- Large plaque volume with disproportional outward growth with relatively mild luminal stenosis
- Positive remodelling index of 1.05
- Plaque burden of 70% stenosis and minimum luminal area < 4 mm² and TCFA: strong independent predictors of MACE



Low-attenuation plaque

Lipid core correspond to low attenuation area:

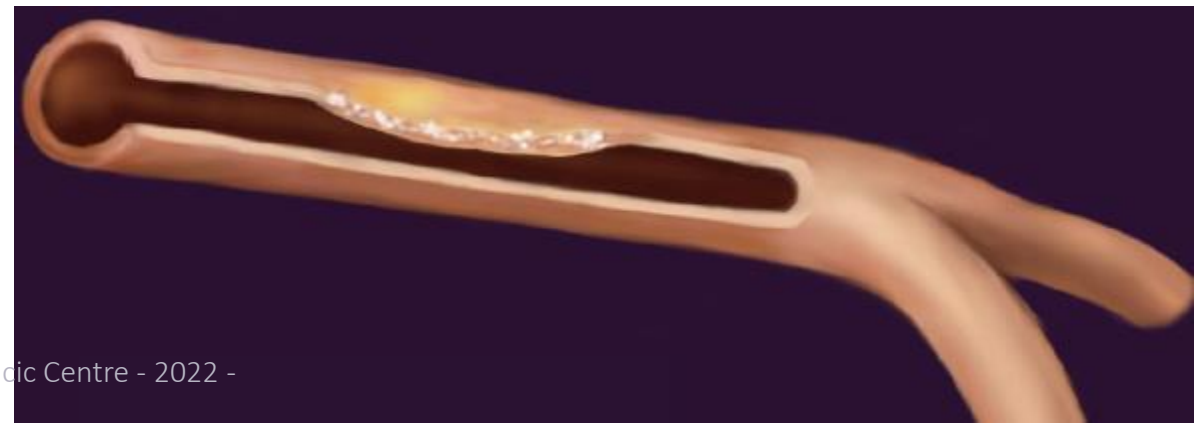
- Dense calcium plaque HU > 350
- Fibrous plaque 131 to 350 HU
- *Fibro-fatty plaque 31 to 130 HU*
- *Necrotic core plaque – 30 to 30 HU*

- *Cut-off : -30 to 60 HU*



Spotty calcification

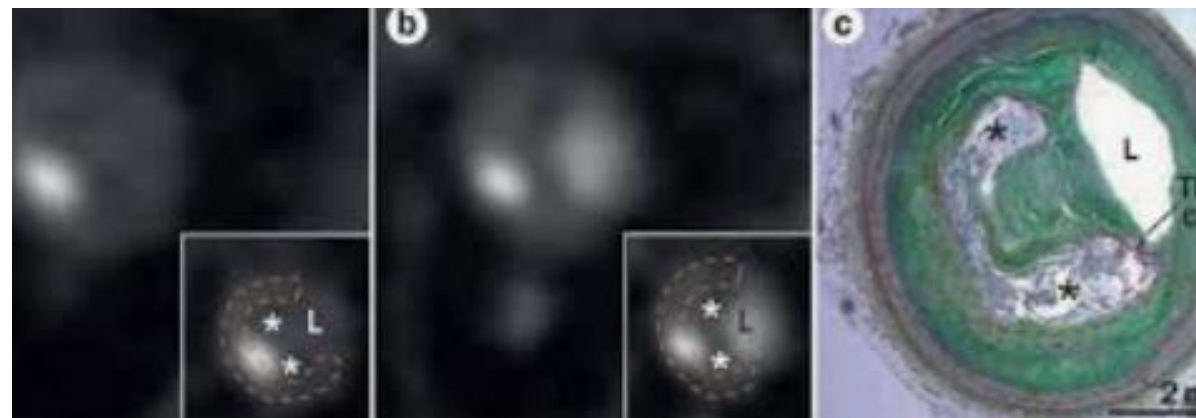
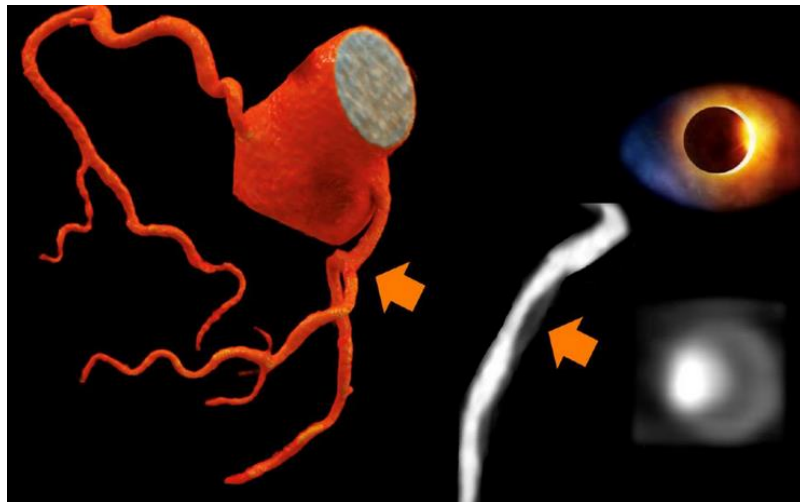
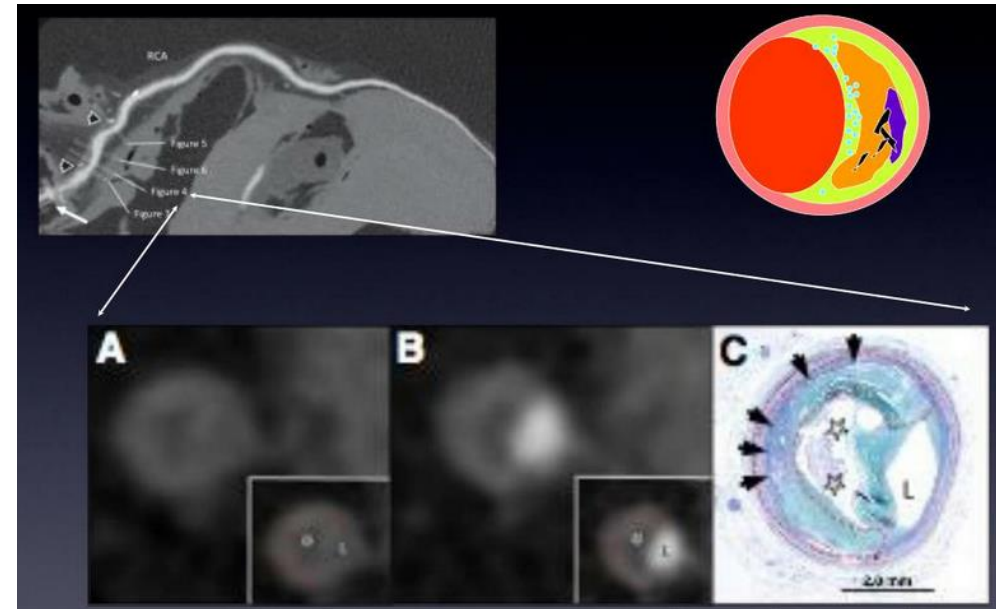
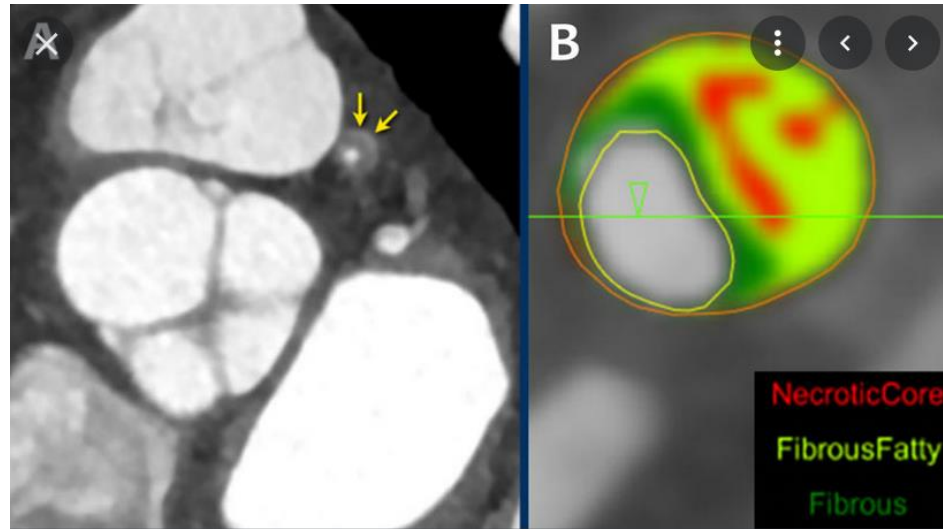
- Calcification with length < 3 mm and occupying < 90 degrees of vessel arc or ...
- $2/3$ the width and length of the vessel
- Evaluation limited by actual low spatial resolution
- But future system can overcome this limitation



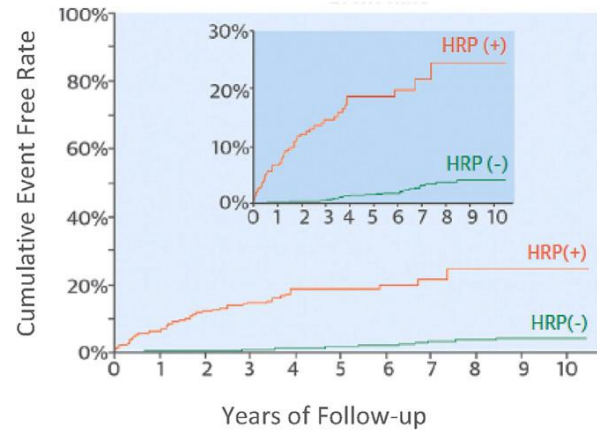
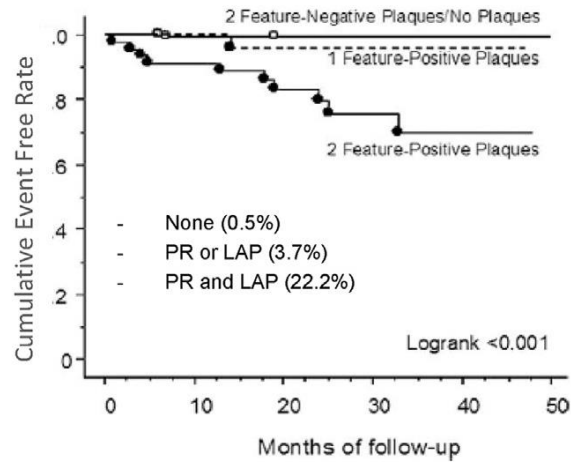
Napkin ring sign

- Napkin ring has PPV of 87% for identifying disrupted plaque
- To exclude disrupted plaque with NPV of 84% absence:
 - positive remodelling (> 1.05)
 - low-attenuation plaque (< 40 HU)
 - napkin ring sign

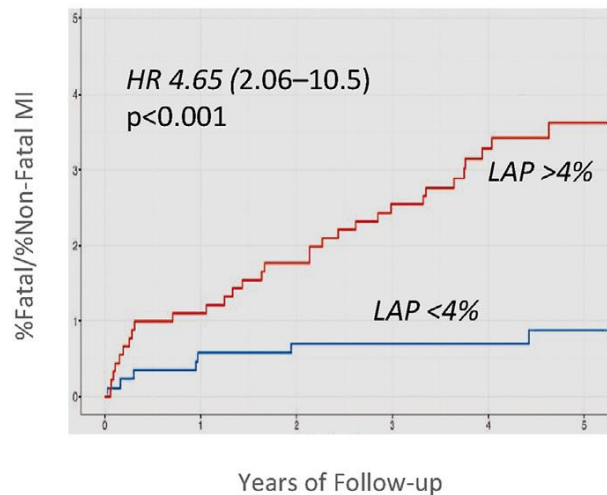
Napkin ring sign



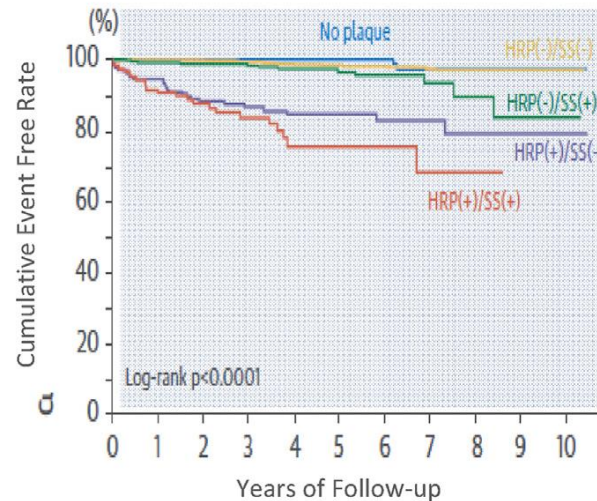
HRP: validation studies



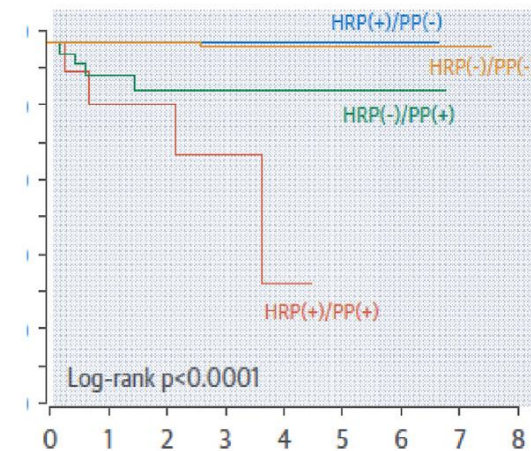
C



D



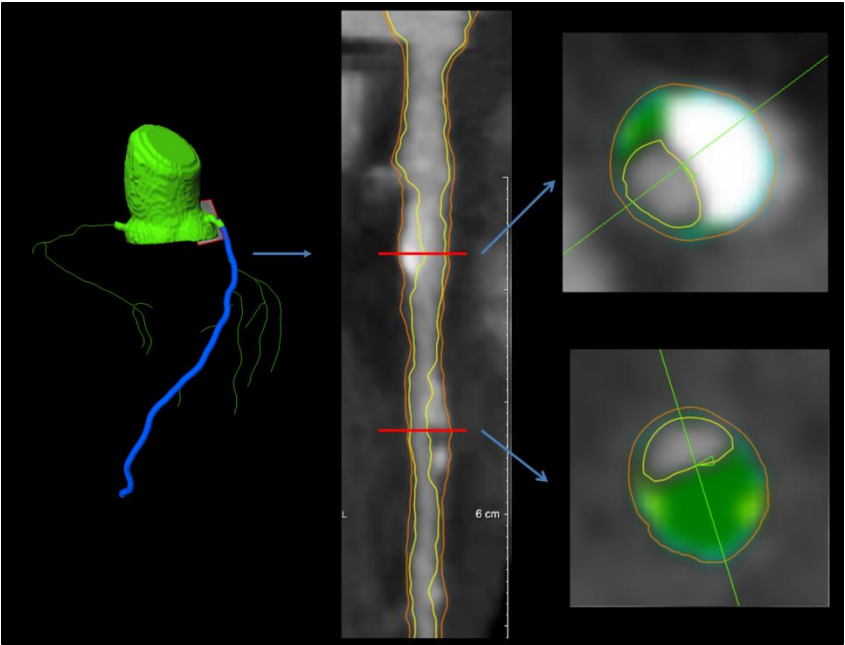
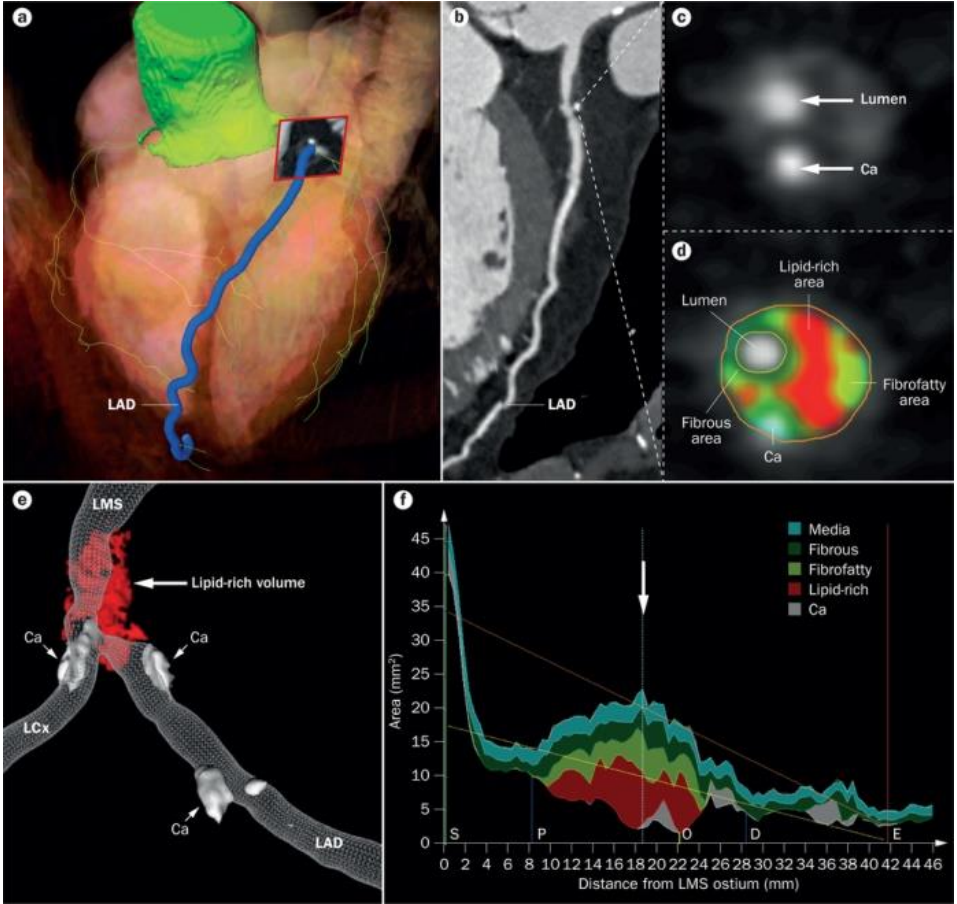
E



LIMITATION

- intrinsic spatial resolution of 0.5 mm
- low attenuation difference between plaque tissue and perivascular fat
- lower level of image noise
- lower plaque artifacts
- overlap of measured HU among individual noncalcified plaque components (lipid rich vs fibro-fatty vs fibrous)
- reproducibility and interobserver agreement requires additional investigation and improvement
- automated quantification is available but investigational
- even if we can risk stratify direct intervention are not yet defined (statine ?)
- more data for positive predictive value of HRP

PLAQUE NATURE



**THE FUTURE:
VISIONARY PROJECT**



J.-L. Berrier



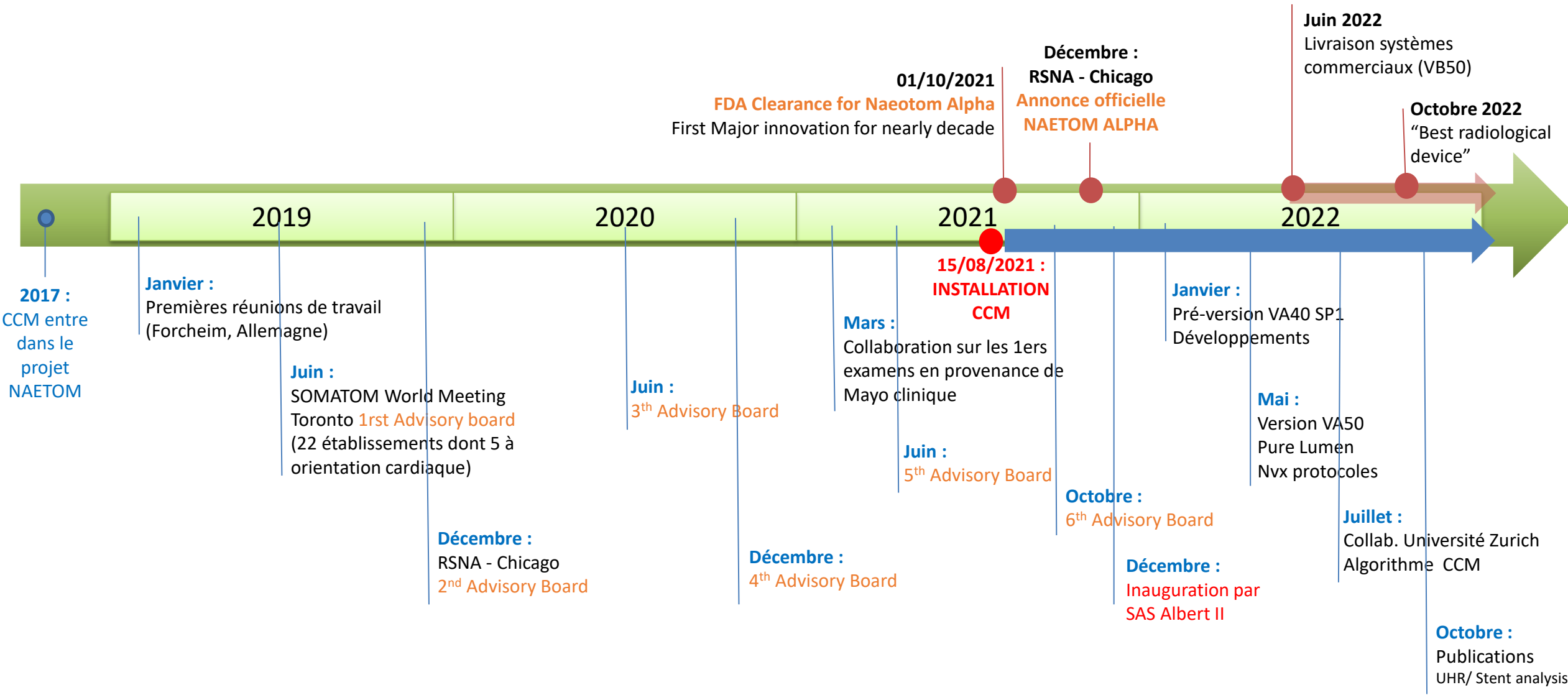
T. Flohr



B. Schmidt



S. Rusek





08/30/2021



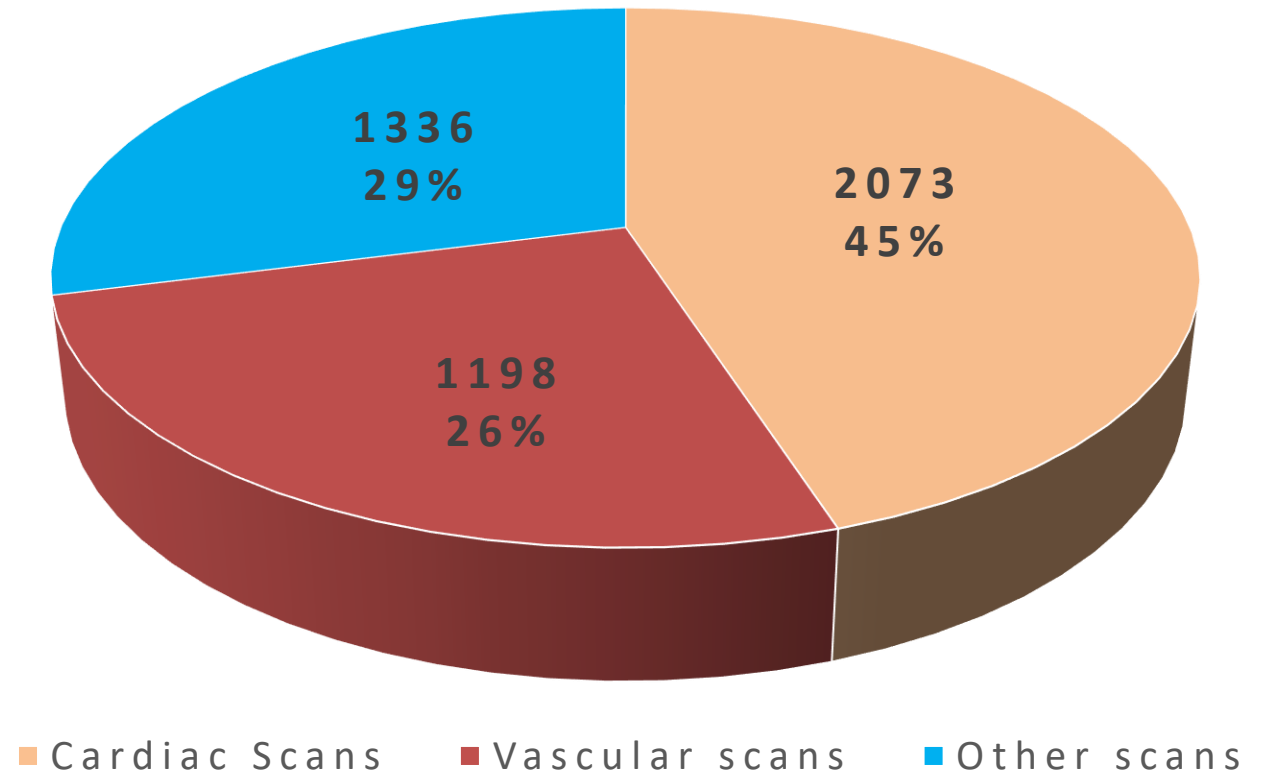
CT Team , Monaco Cardio-Thoracic Centre - 2022 -

SOME NUMBERS

Since 09/2021 -09/2022 | 12 months | 4607 scans

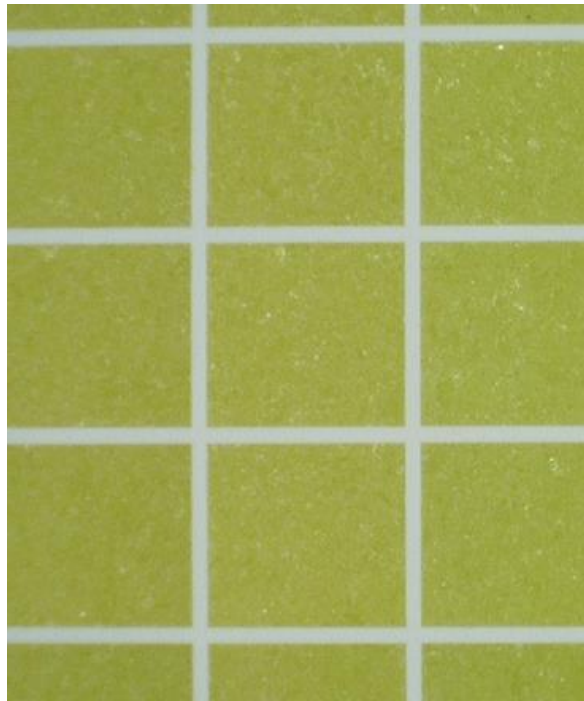
- Cardiac Mode {
- 1029 Cardiac Spiral scan
 - 728 Cardiac Turbo flash
 - 207 Pure Calcium scoring
 - 65 Bypass spiral scans
 - 22 Bypass Turbo flash
 - 307 Tavi Turbo flash scans
 - 141 Ao Tflash
 - 22 UHR stent scan
-
- 121 Abdominal Aorta
 - 42 Pulm Angio
 - 371 Lower legs vascular
 - 160 Supra Aortic trunks
 - 1199 Thorax Precovid scan
 - 113 Head scan
 - 80 Abdomen

Total Scans: 4607



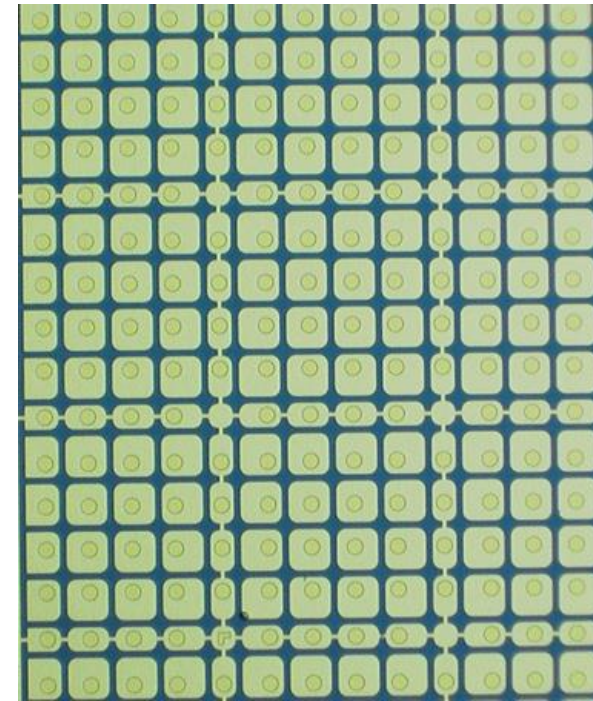
Photon counting detectors offer new possibilities

Smaller pixels for sharper images at less radiation dose



1 mm

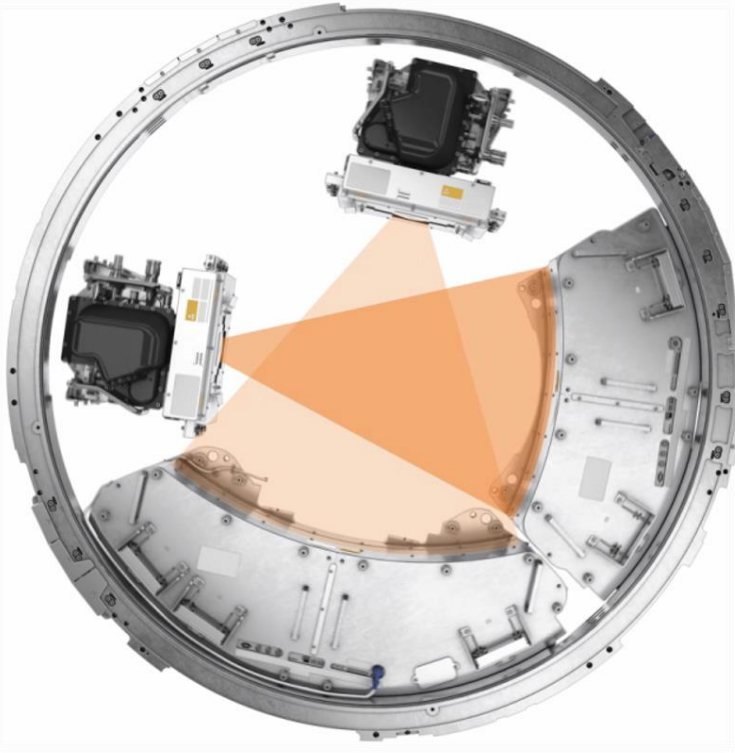
Conventional detector



Photon counting detector

Not only a new detector

Short exposure time enabled by Dual Source technology



66 ms exposure time per image



Two detectors and two X-ray sources
reduce the image acquisition time by
a factor of two

Moving organs are frozen in their motion

Photon counting CT

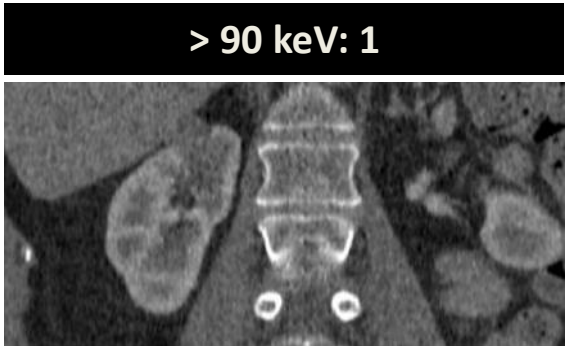
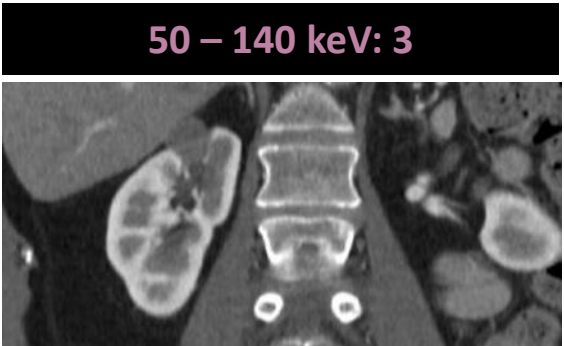
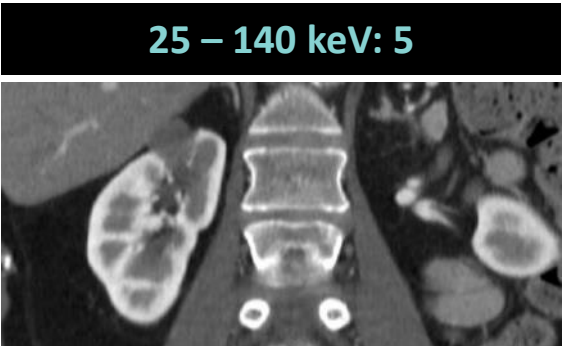
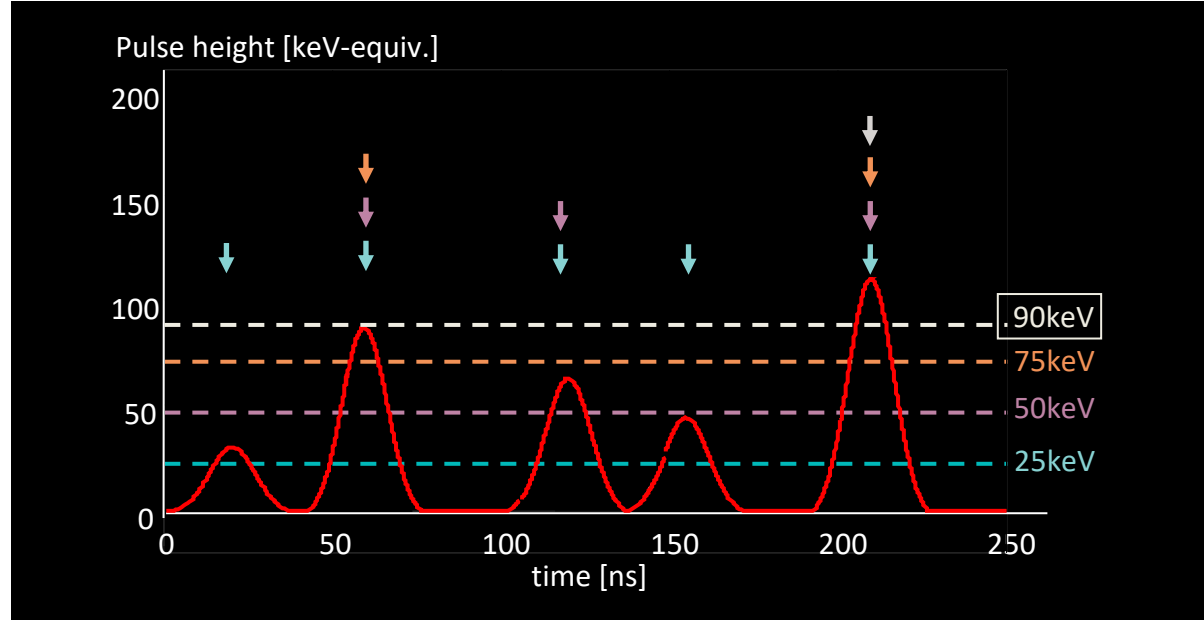
Intrinsic spectral sensitivity

X-rays generate signal pulses with a pulse height proportional to the x-ray energy

Pulses are counted as soon as they exceed a threshold

Counting of pulses above multiple thresholds yields spectral information

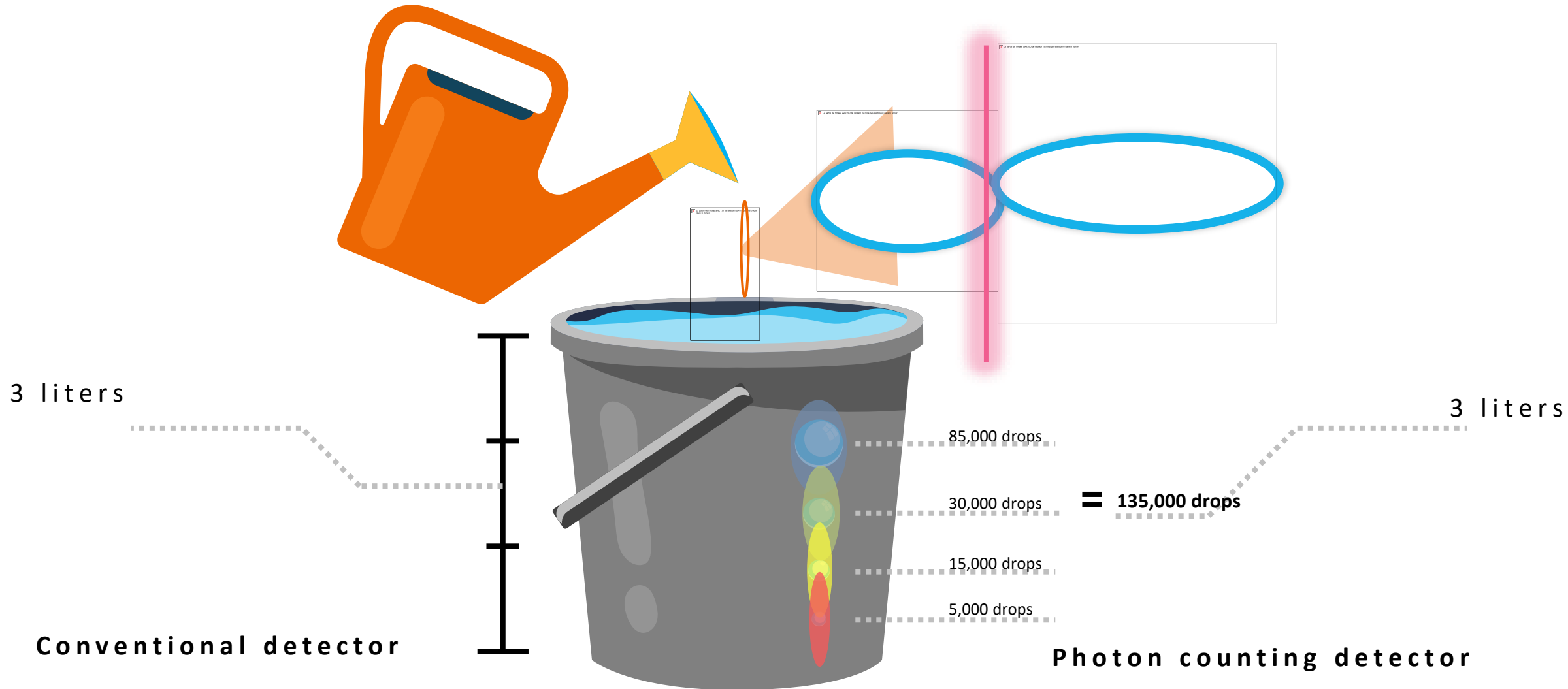
E. g. 4 thresholds:
25 keV, 50 keV, 75 keV, 90 keV in a 140 kV scan



Courtesy of NIH, Bethesda, USA

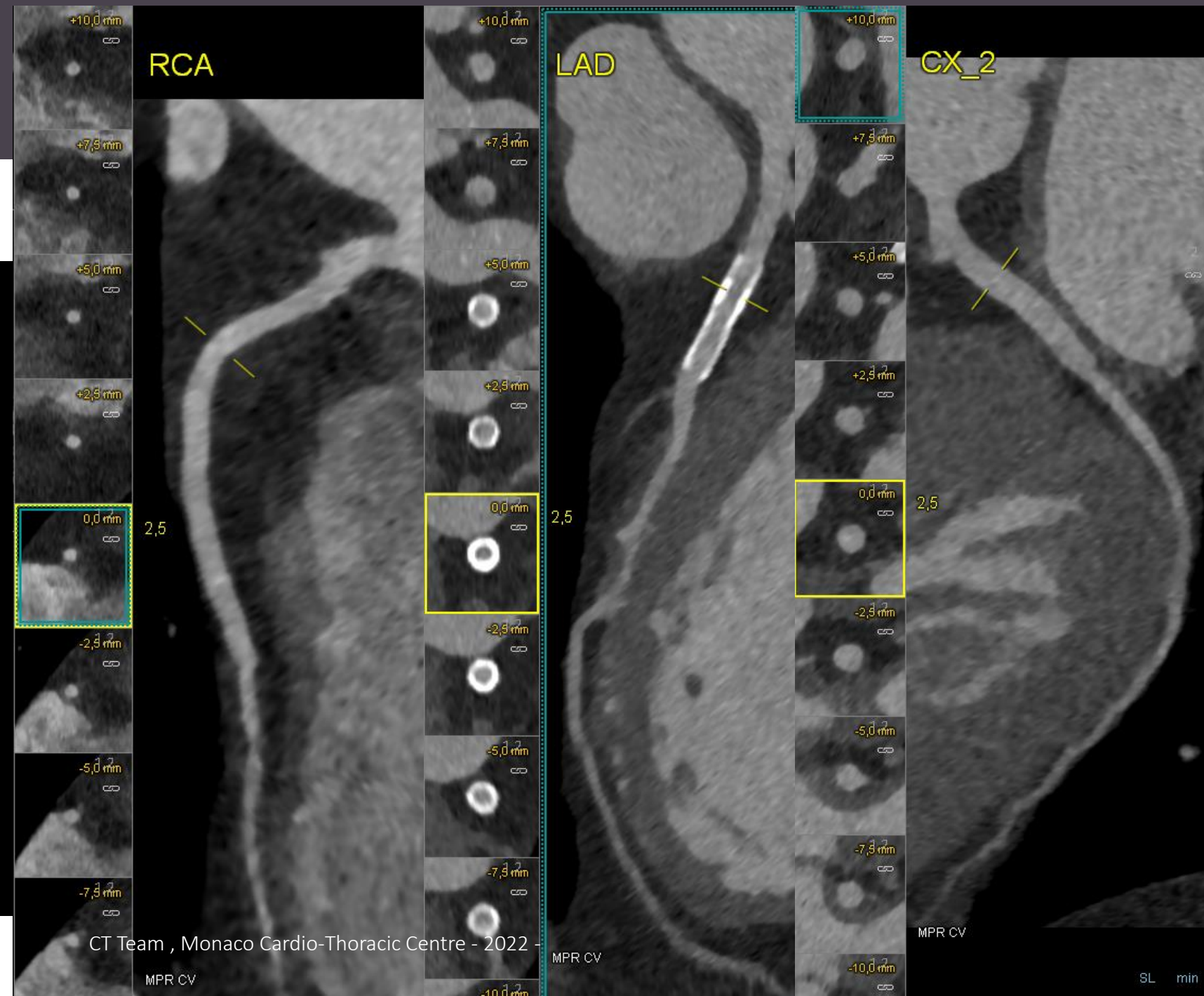
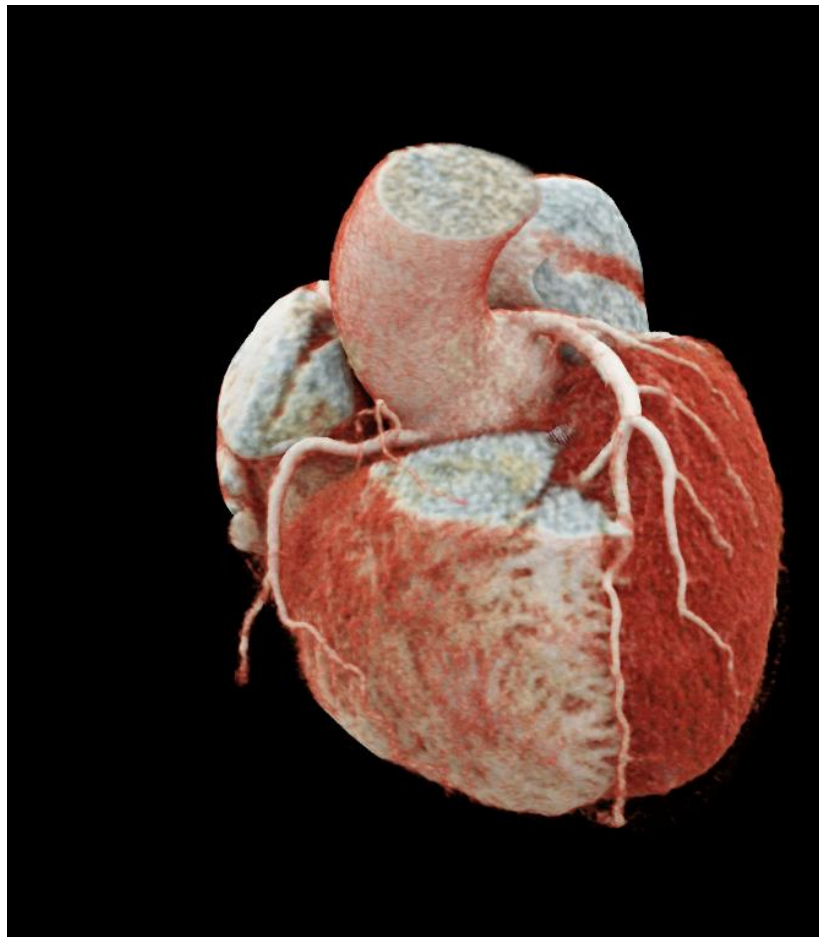
Photon counting detectors offer new possibilities

Energy-resolved data offer new possibilities – a graphic comparison

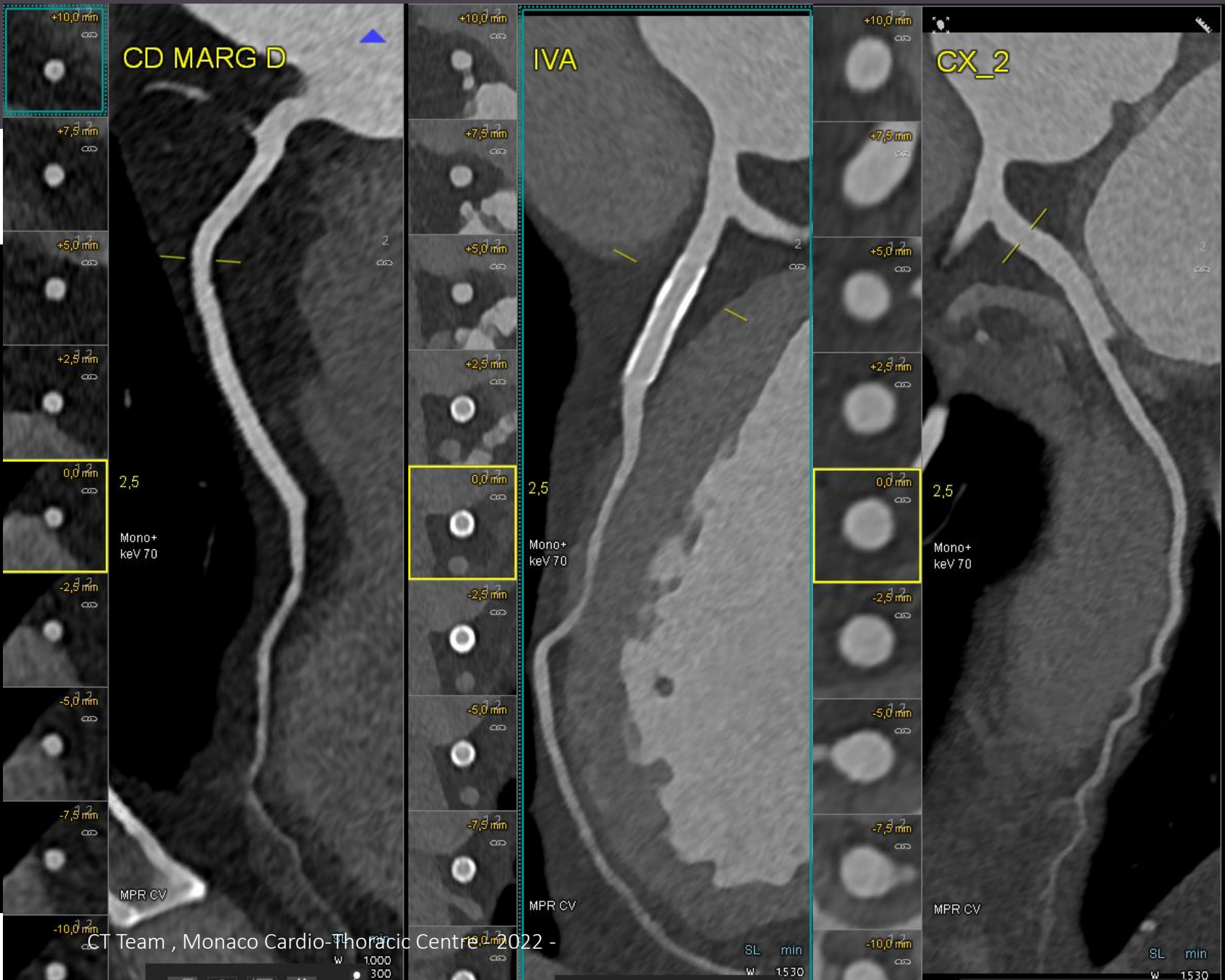
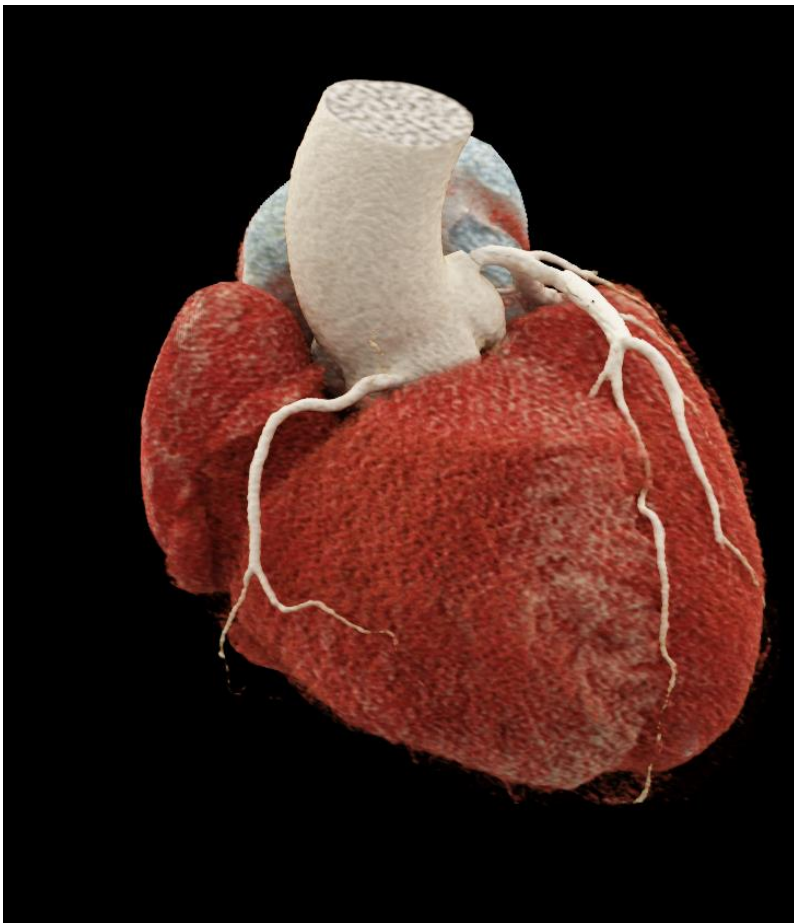


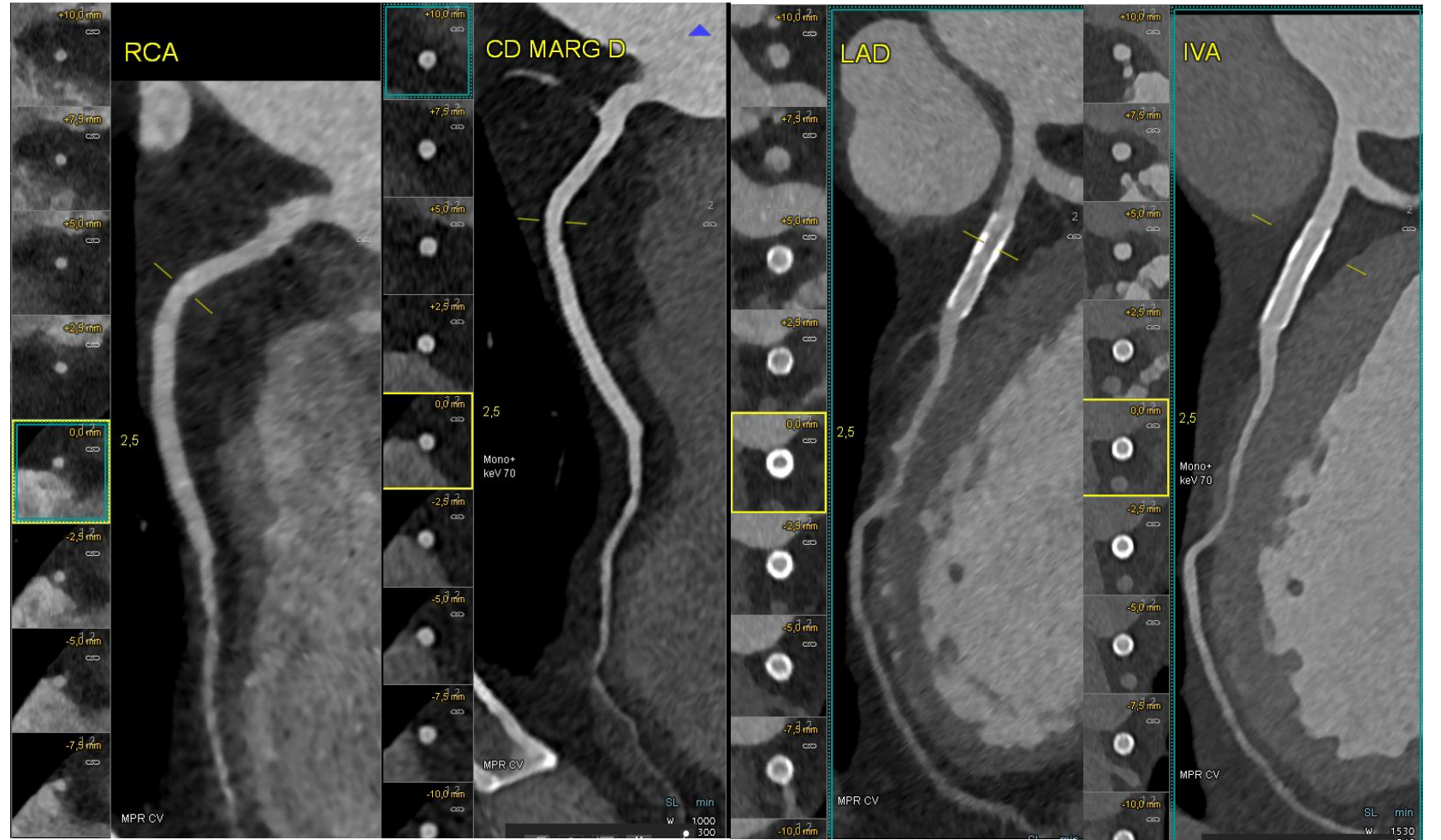
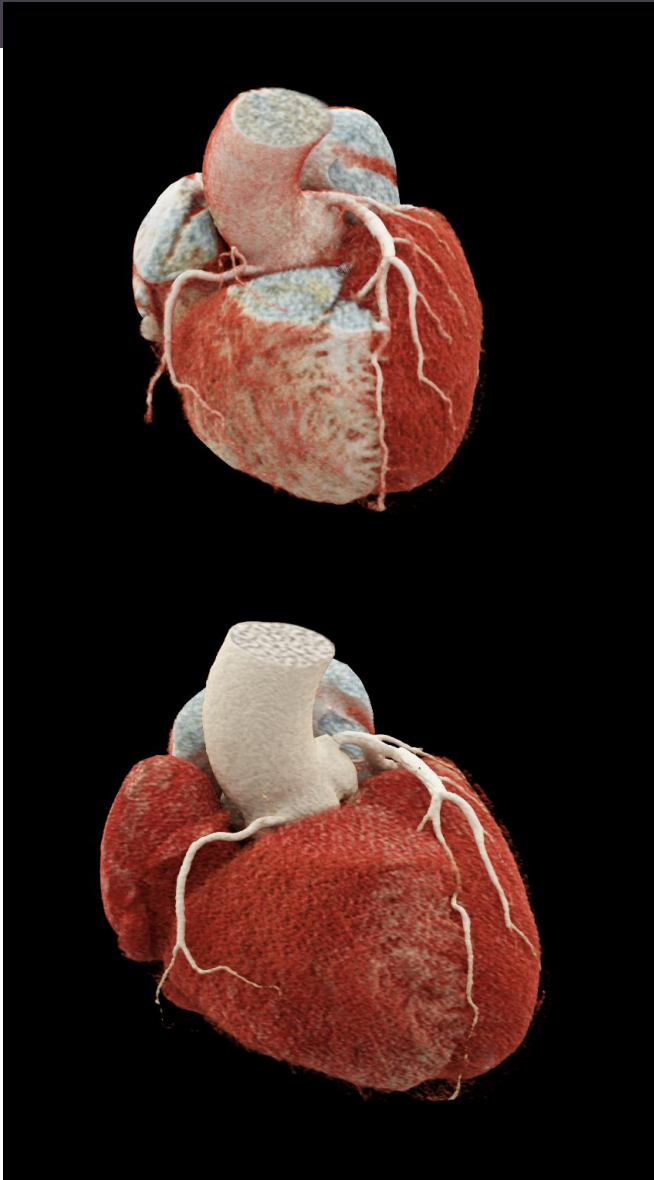
FORCE vs PHOTON COUNTING

Mr SC 53 Years
Scanner Force 01/23/2020
0.6 mm Slice
Ct Control Stent IVA ;
Suspect stent infiltration



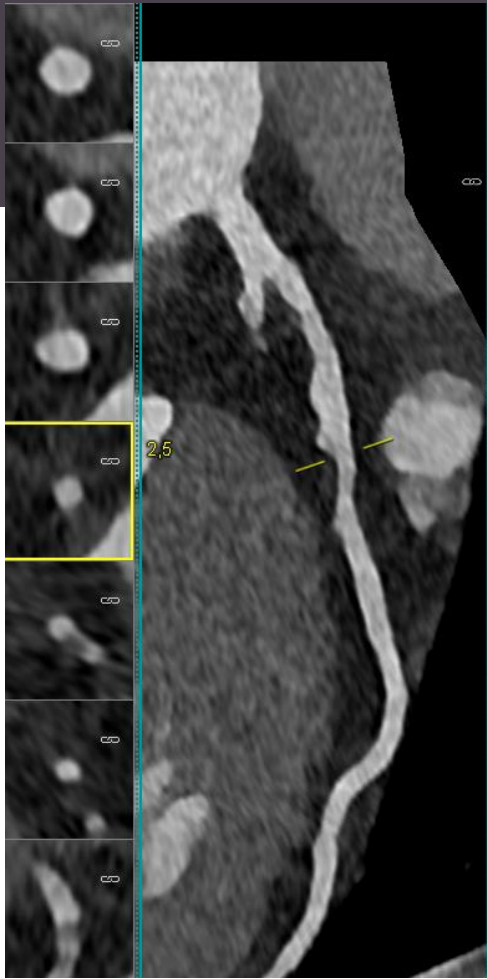
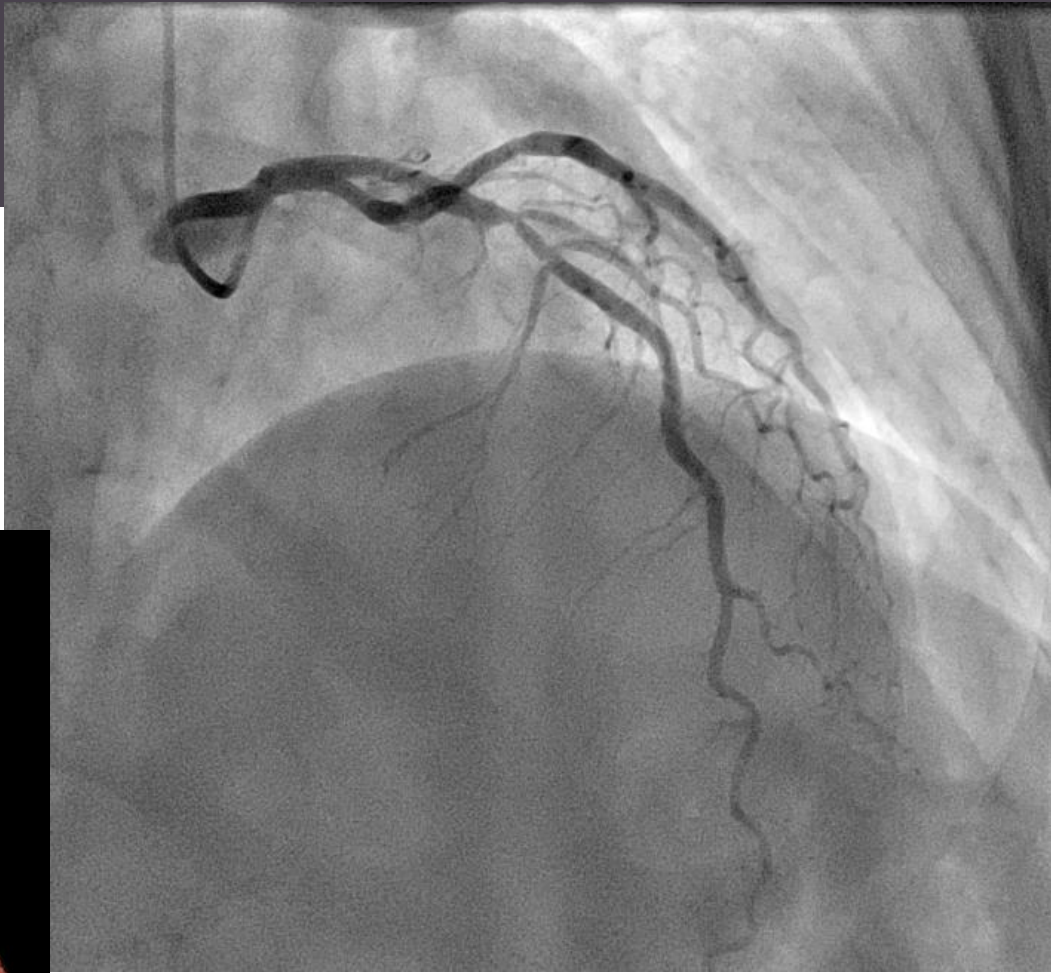
Mr SC 53 Years
Ct Control Stent IVA
Naeotom **10/18/2021**
0.4 mm Slice





CORRELATION CT vs XA

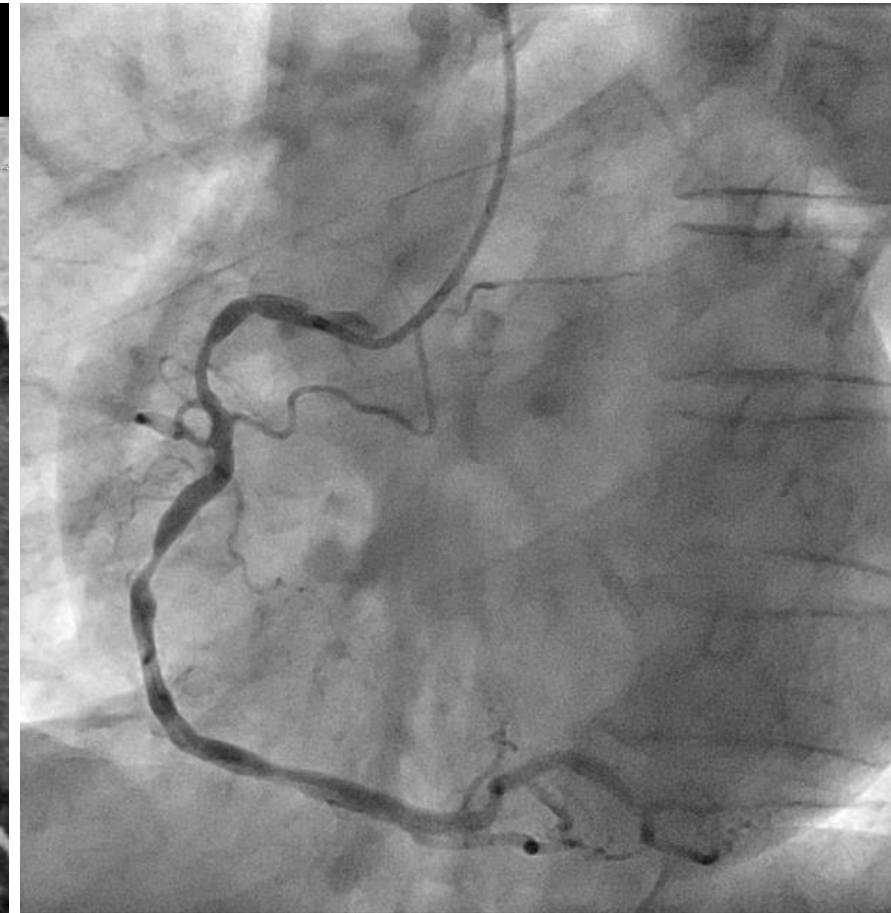
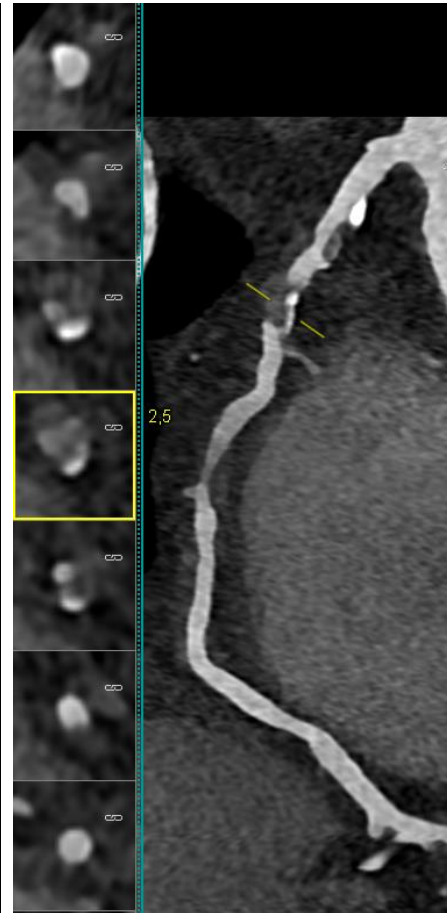
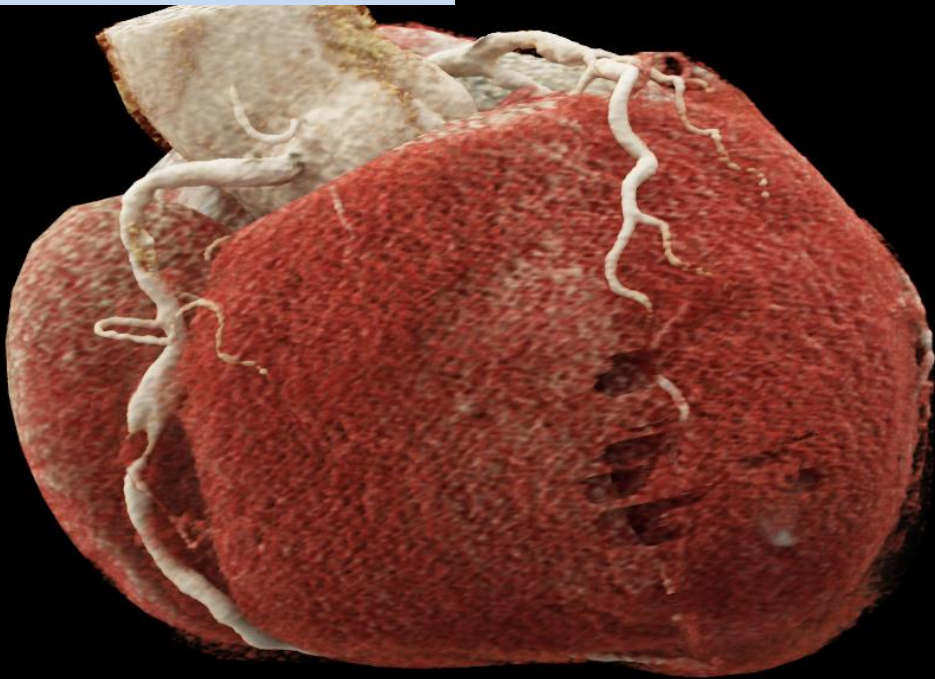
Mrs D.
59 y.
CT Scan 09/14/2021
Stent LCx
Risk factors +++
Dyspnea

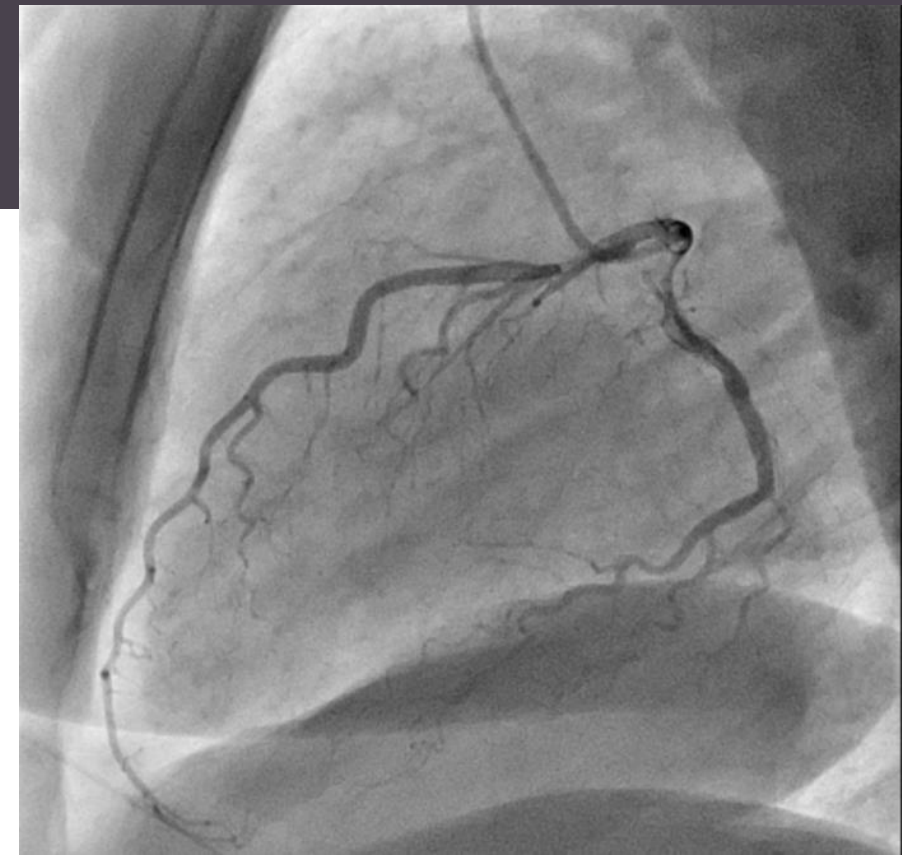
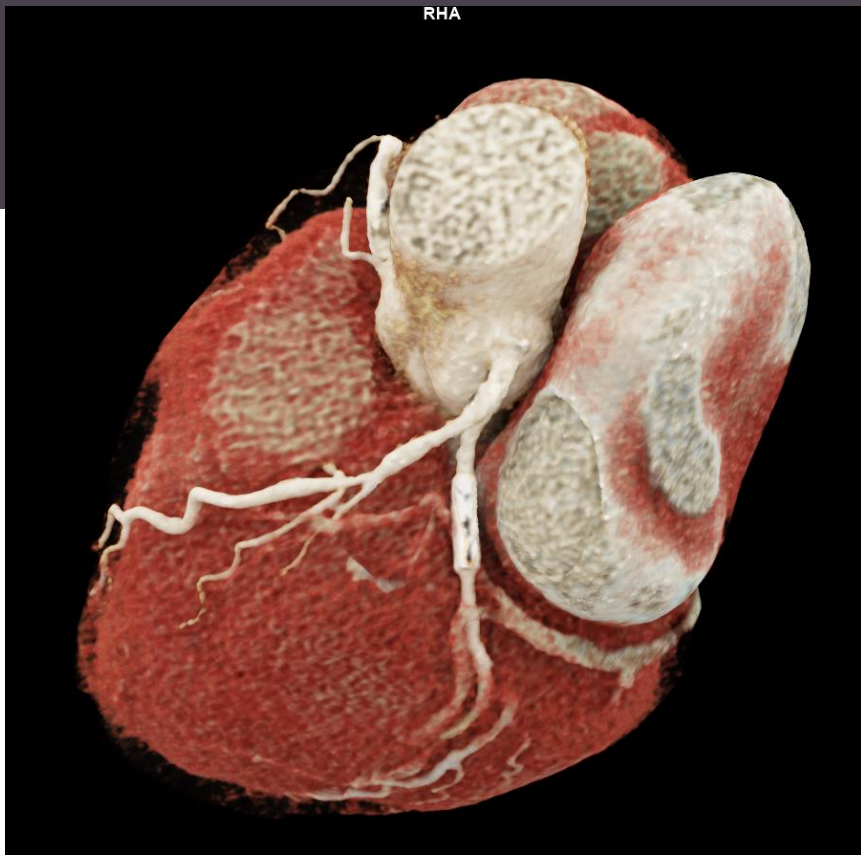


LAD

CA

Mrs D.
59 y.
CT Scan 09/14/2021
Stent LCx
Risk factors +++
Dyspnea



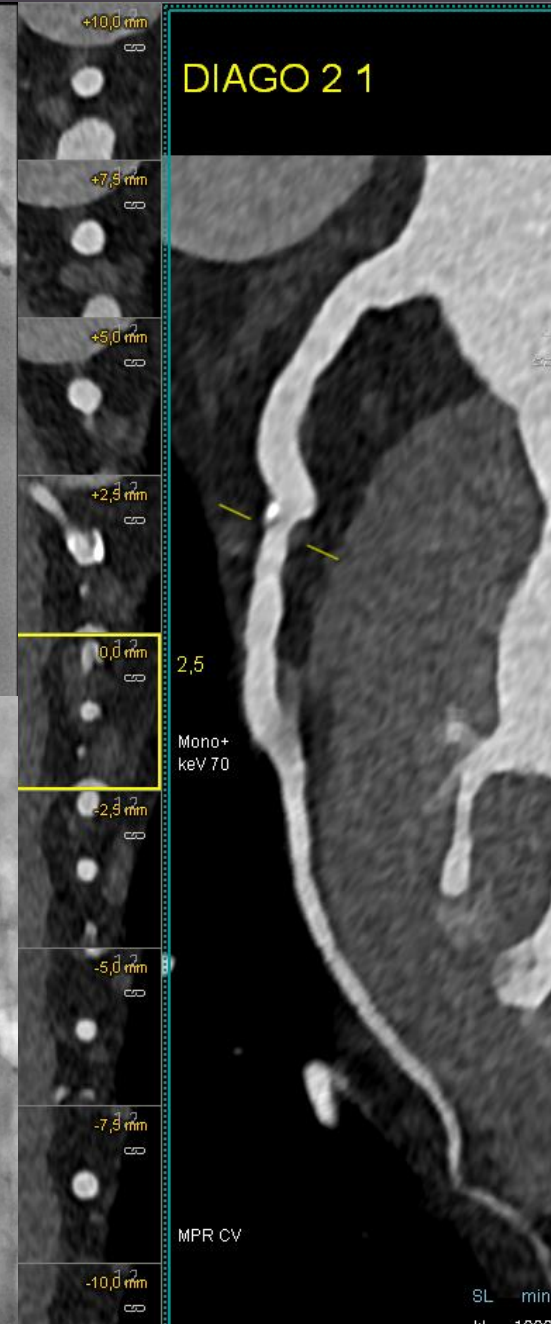
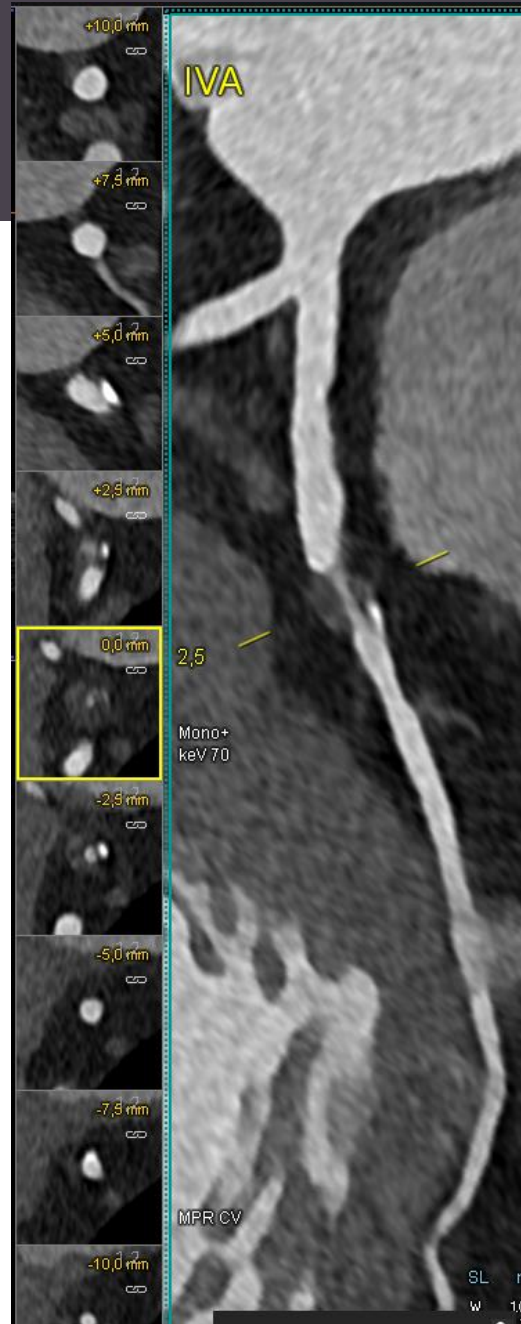


Mrs D.
59 y.
CT Scan 09/14/2021
Stent LCx
Risk factors +++
Dyspnea

GREAT CORRELATION CT vs XA 2

Mr Gl.. R ...62y.
CT Scan 10/07/2021

Risk factors (smoking)
No symptoms
Pre surgical (ortho)
evaluation



Mr Gl.. R ...62years
CT Scan 10/07/2021

Risk factors (smoking)
No symptoms
Pre surgical (ortho)
evaluation





VB40 to VB50

What are the differences?
How to increase IQ?

Case #1 (DIO...)

Compare VB40 before sp1 to VB50 kernel

General parameters

Aquisition mode:

- 144x0.4

Reconstruction mode:

- Slice thickness: 0.4 mm
- Iterative index: 3

Soft version: VB40 (before sp1)

- CPR (LAD)
- Bv 40
- 70 Kev

• Soft version: VB 50

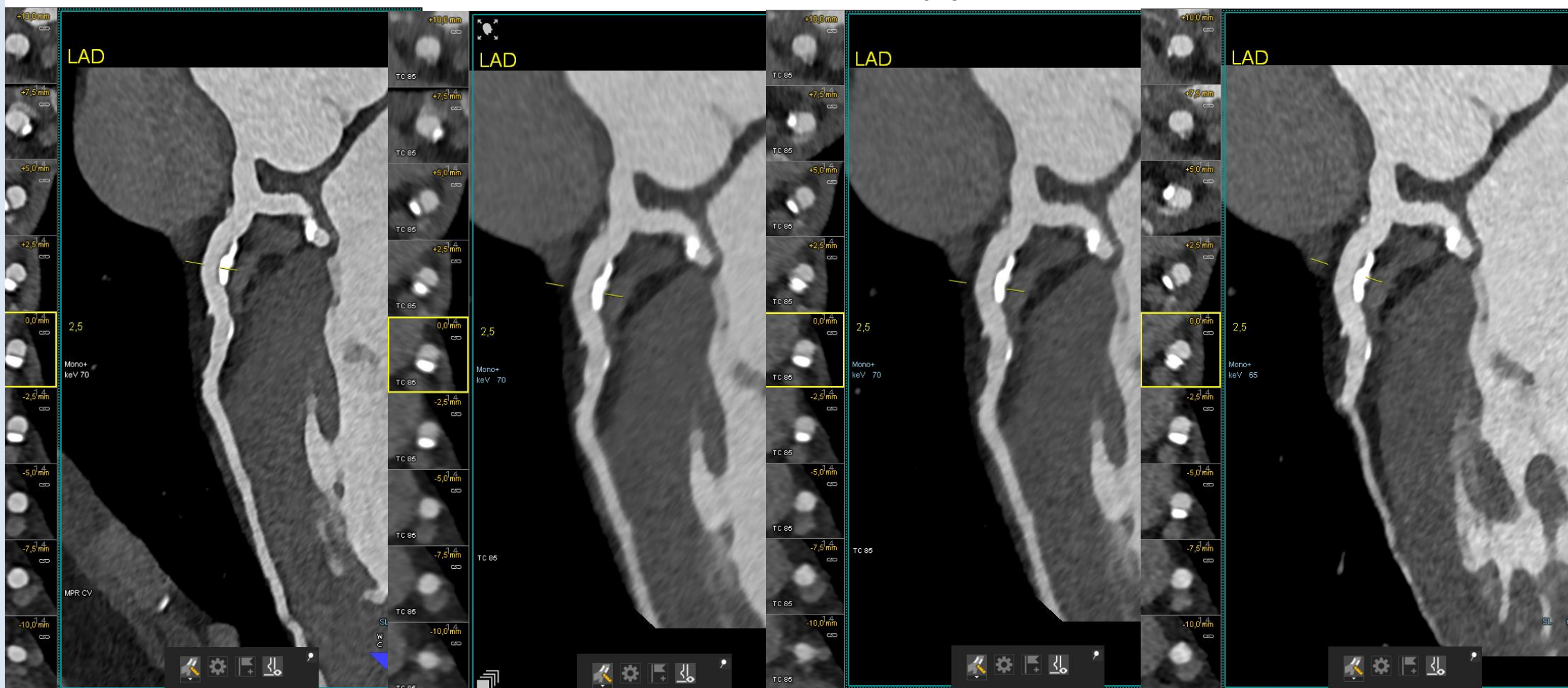
- CPR (LAD)
- Bv 36
- 70 Kev

• Soft version: VB 50

- CPR (LAD)
- Bv 40
- 70 Kev

• Soft version: VB 50

- CPR (LAD)
- Bv 44
- 70 Kev



Case #1 (DIO...)

Compare VB40 before sp1 to VB50 kernel

General parameters

Acquisition mode:

- 144x0.4

Reconstruction mode:

- Slice thickness: 0.4 mm
- Iterative index: 3

Soft version: VB40 (before sp1)

- CPR (LAD)
- Bv 40
- 70 Kev

• Soft version: VB 50

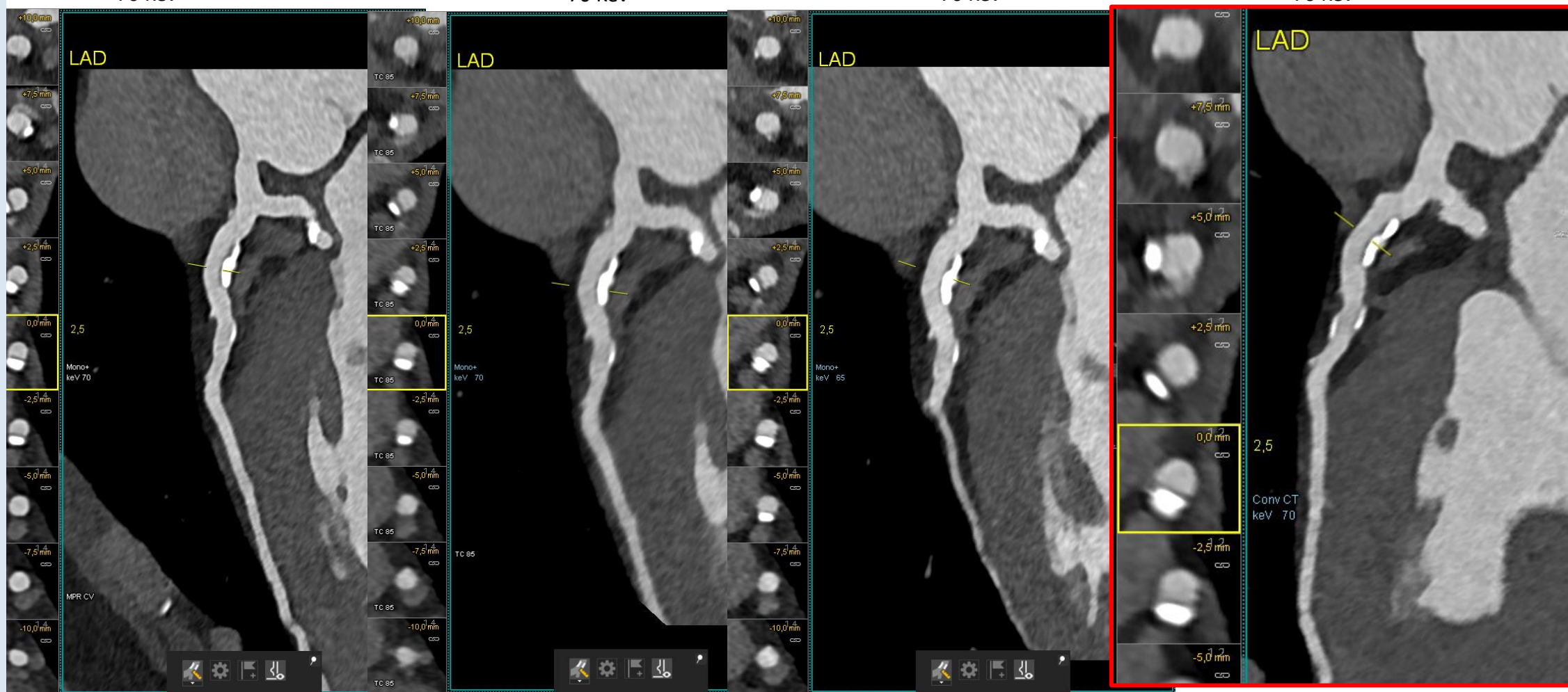
- CPR (LAD)
- Bv 40
- 70 Kev

• Soft version: VB 50

- CPR (LAD)
- Bv 44
- 70 Kev

• Soft version: VB 50

- CPR (LAD)
- Bv 44 v2 IT4
- 70 Kev



- Bv 44 on VB50

To much noise and lack of edge enhancement

- Bv 40 on VB50

To smooth => imprecise vessel border

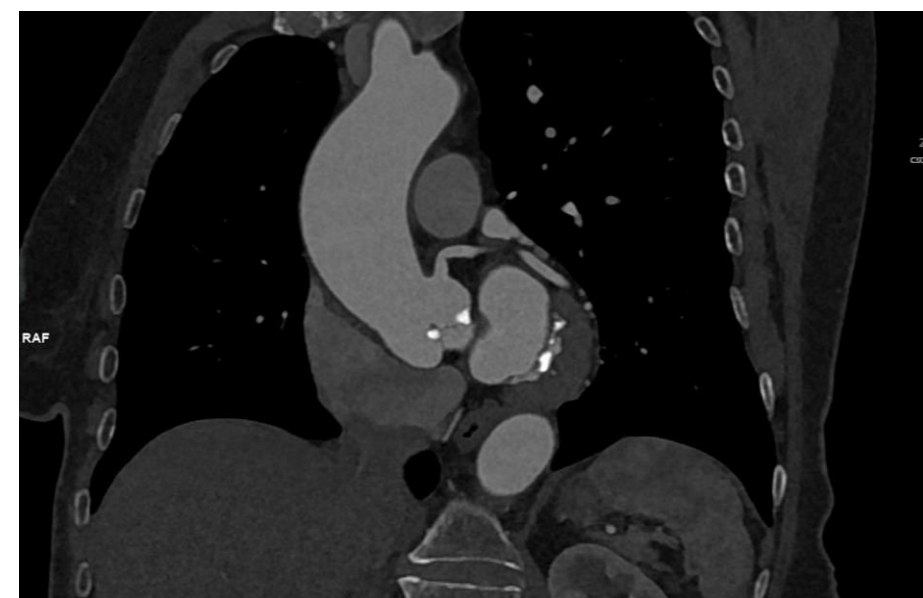
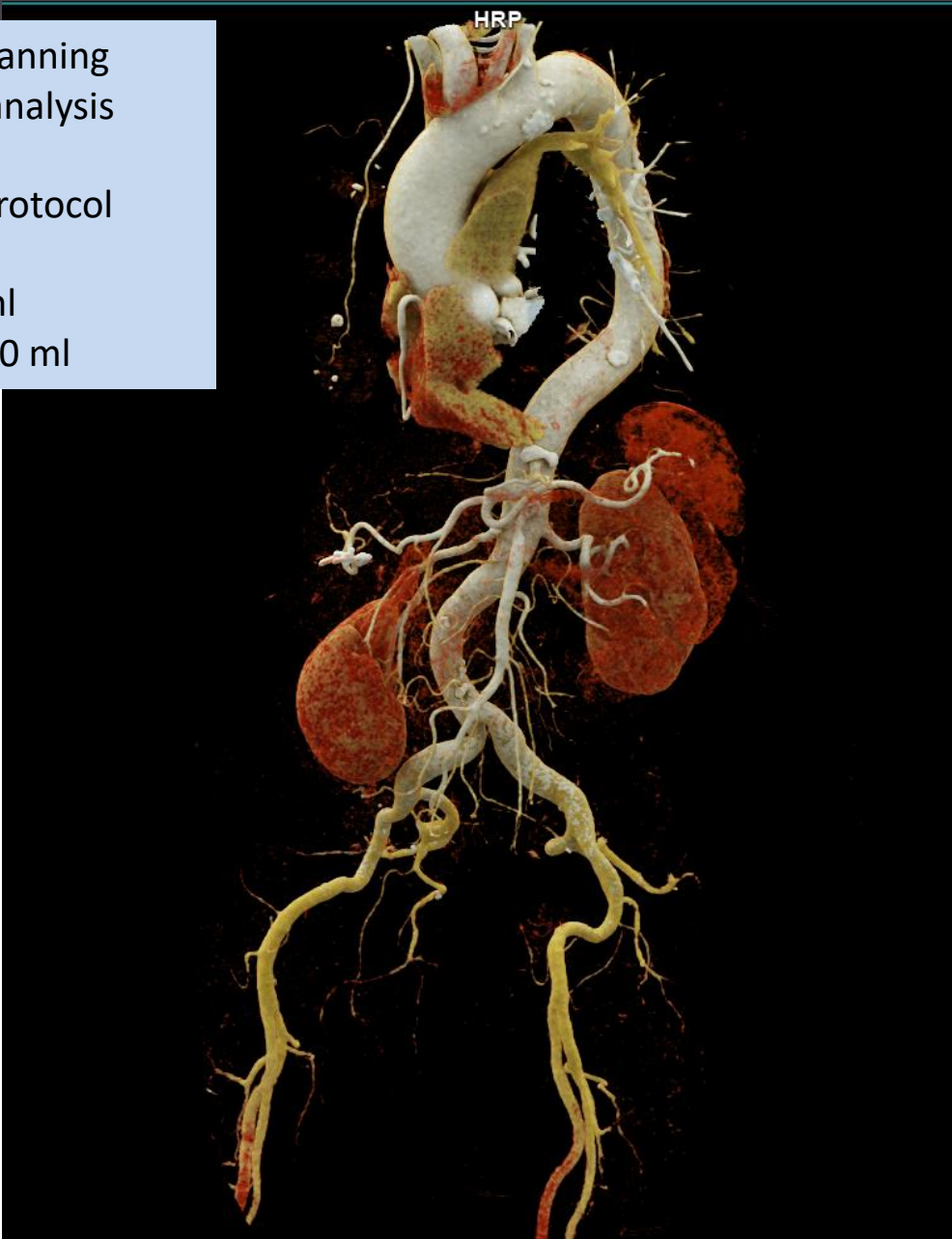
Conclusion :

We need a kernel between Bv 40 an Bv 44 (maybe 42) with edge enhancement DONE

TAVI

Mrs L. TAVI Planning
Calcification analysis

Turbo Flash Protocol
IQ Level: 90
Contrast 60 ml
Saline Flush 50 ml



Mrs
BEN...

2 Analyse de la valve

Diamètres Anneau Basal ✓

Éditer/créer le contour de l'anneau basal ?

Créer un nouveau contour

Min	19.2 mm
Max	23.3 mm
Basé périmètre	21.4 mm
Basé surface	21.1 mm
Périmètre	67 mm
Surface	350 mm ²

Diamètres Sinus de Valsalva -

Hauteur des Coronaires

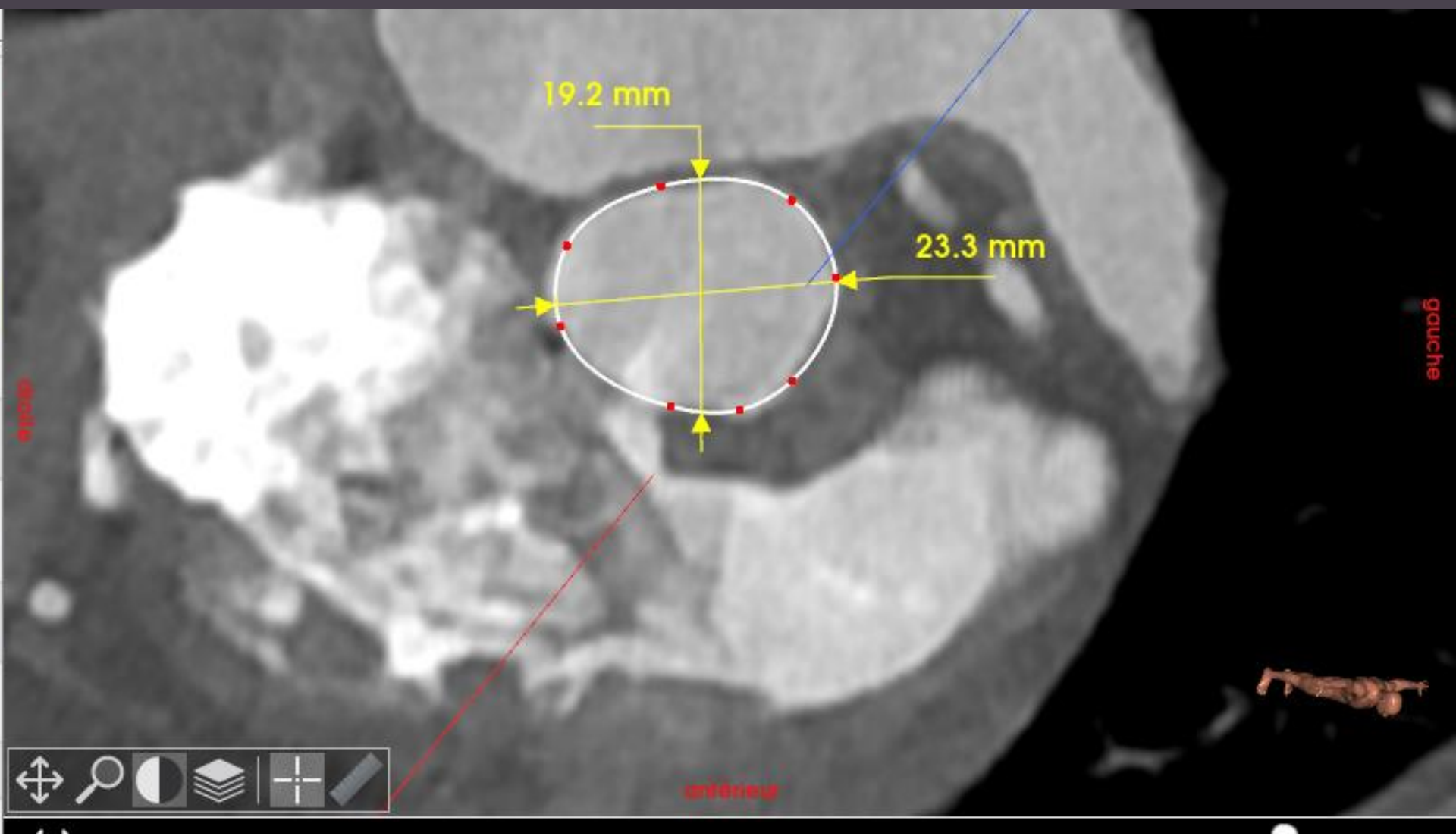
Droite	13.1 mm
Gauche	13.8 mm

Diamètre Aorte Ascendante - mm

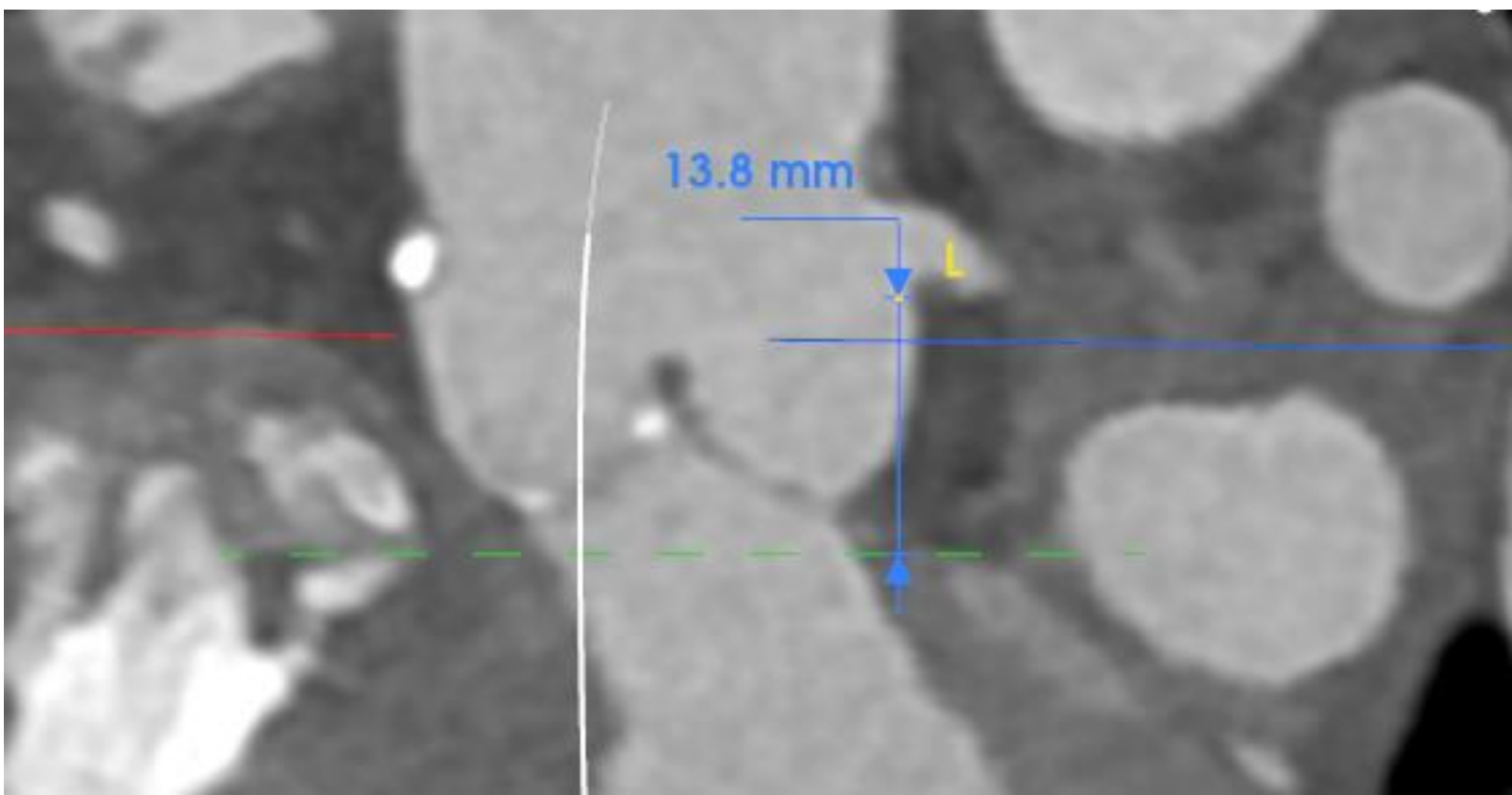
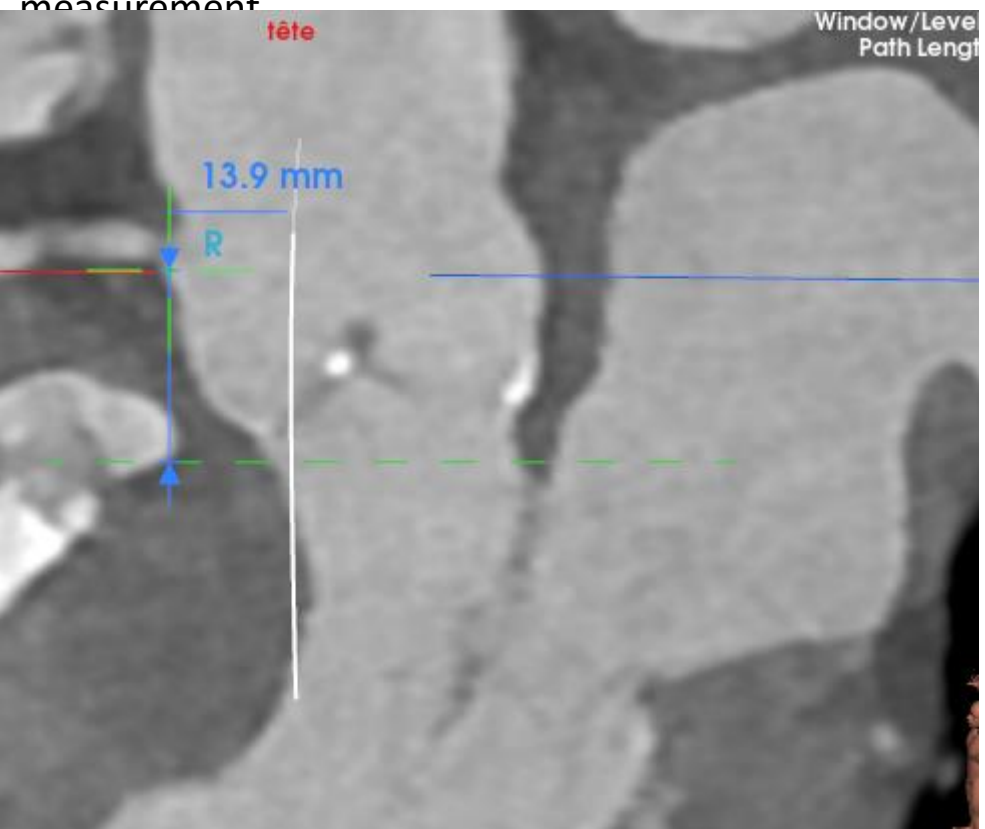
Distance JST-Anneau - mm

Scores de Calcification

Incidence de scopie



Mrs BEN...
Tavi Planning
Standard
measurement

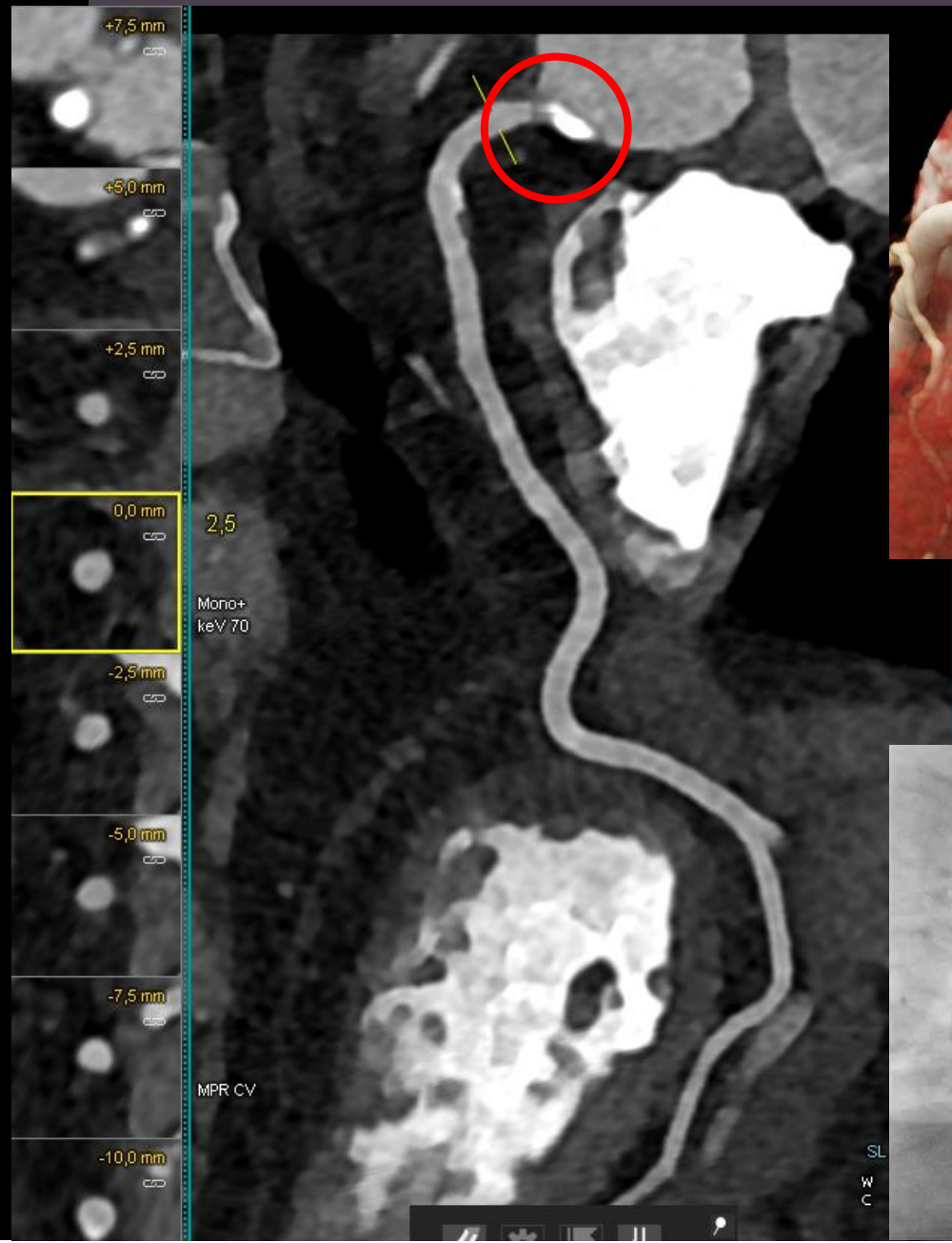


Turbo Flash Protocol
IQ Level: 90
Contrast 60 ml
Saline Flush 50 ml

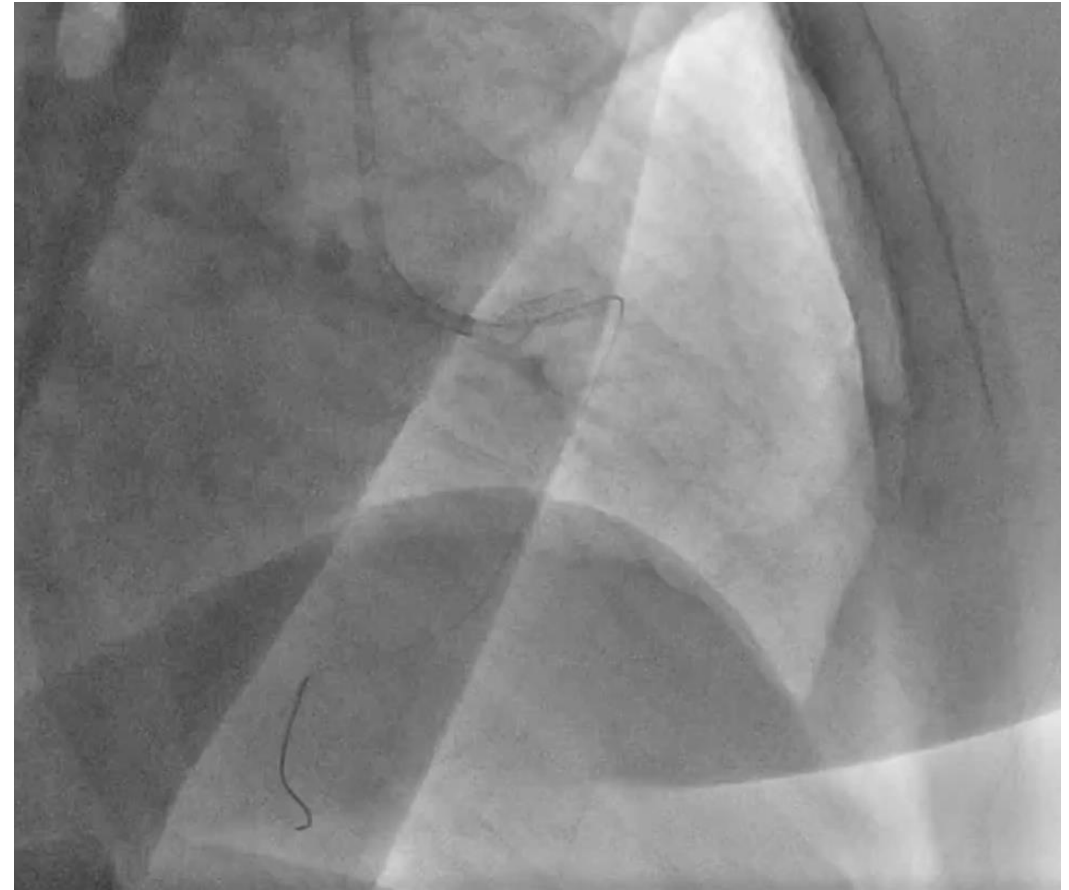
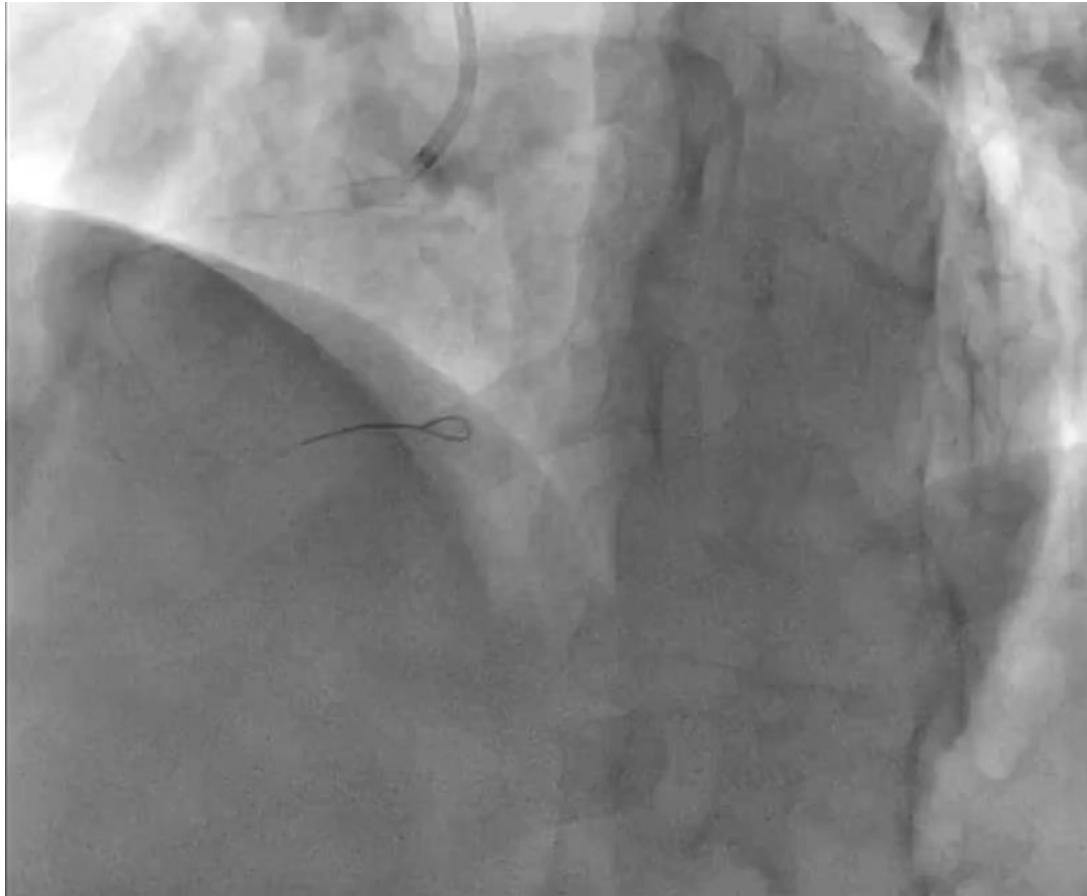
Mrs BEN...
Tavi Planning
Distal Vessel Assesment



Mrs BEN...
Tavi Planning
Coronary Analysis



Mrs BEN...
Direct rca Stenting before
procedure



VALVULAR

MECHANICAL PROSTHETIC VALVE LEAFLET

The image displays the Siemens Healthineers CT Cardiac Function software interface. The main window shows a 3D reconstruction of the heart and aortic valve, with a mechanical prosthetic valve leaflet clearly visible. The interface includes a left sidebar with navigation and analysis tools, a central 3D view, and a right sidebar with quantitative analysis maps.

CT Cardiac Function

Cardiac Planes: Cardiac, Aortic Valve, Mitral Valve

Show Contours, Initialize Manually, Edit Contours, Reset Contours, Movie Series

Left Ventricular Analysis

Blood Volume, Show LV Blood, Edit Plane, Edit LV Blood

Right Ventricular Analysis

Findings Navigator

Name	Value	Source	CT
L4D1	3,09...	MM O...	CT
L3D1	2,62...	MM O...	CT
L2D1	3,65...	MM O...	CT
L1D1	2,58...	MM O...	CT
[1] Dista...	2,90...	MM R...	CT
LV Std...	Left v...	Func	
FILLINGC...	Left v...	Func	
POLARM...	Left v...	Func	
PV	Right	Func	

Tools: Synch, Align, Full Text, Hide Graphics, Hide Lines, Reset Timepol...

Edit Layout, Snapshot, Print Image, Export Image, Undo, Redo

Quantitative Analysis Maps:

- Wall Motion mm (0,00 to 10,00)
- Wall Thickening % (0,00 to 100,00)
- Wall Thickness 5% Phase / mm (0,00 to 15,00)

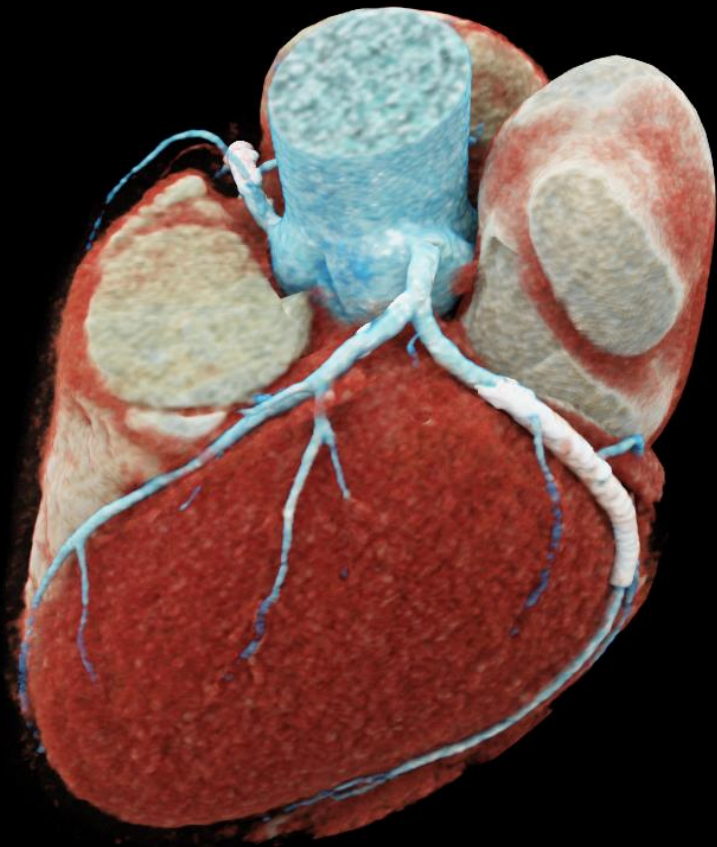
CT Team , Monaco Cardio-Thoracic Centre - 2022 -

UHR Cardiac Scan

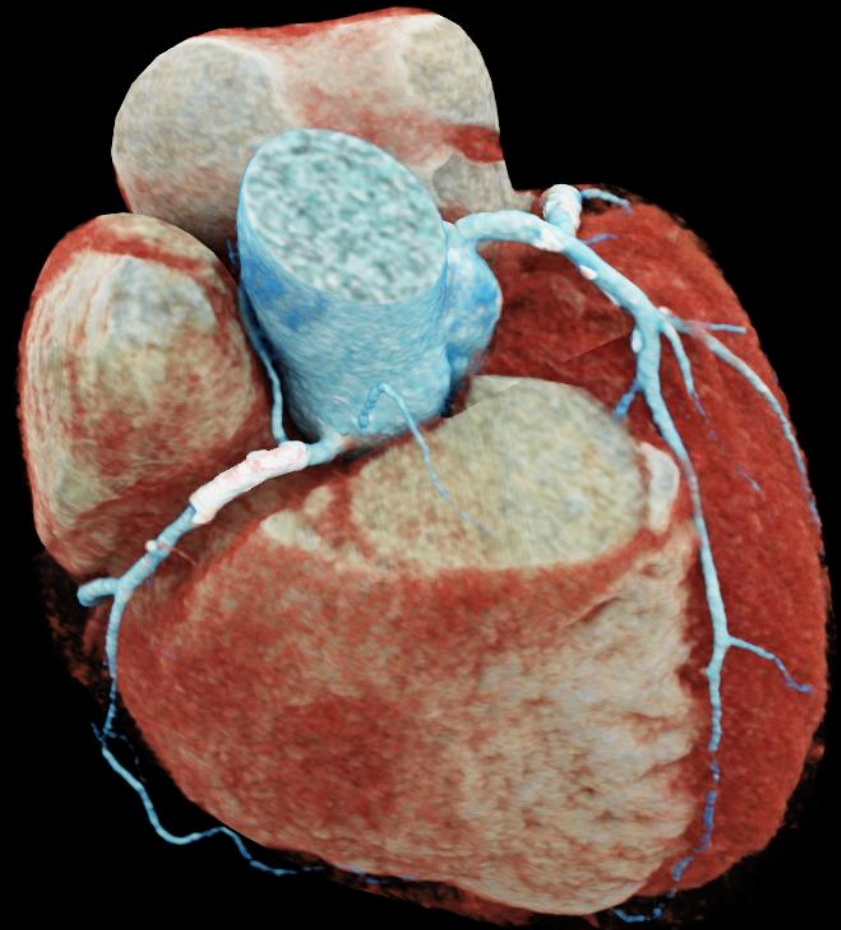
UHR Cardiac Scan

0,2mm slice thickness
120x0,2mm collimation

UHR



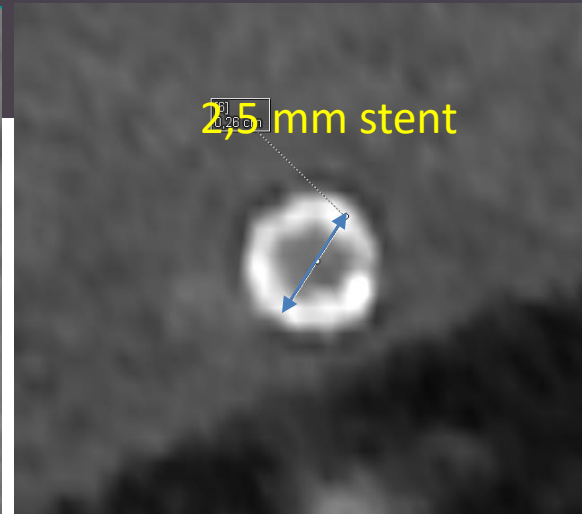
UHR Acquisition
Spiral Acquisition 120Kv
2,4 cm detector coverage
0,2mm/0,2 mm Reconstruction



60 Gb raw data

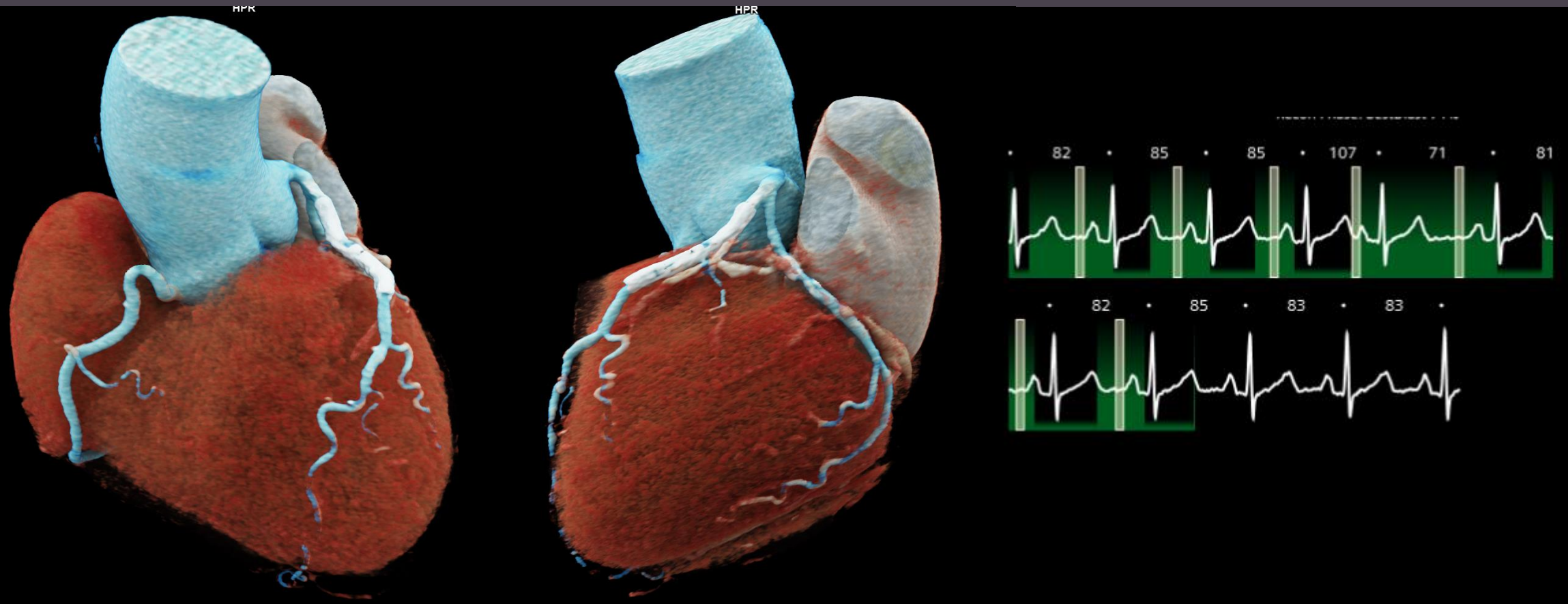
UHR STENT EVALUATION





**Dedicated Sharp Kernel
BV64 improves in-stent
Vizualisation**

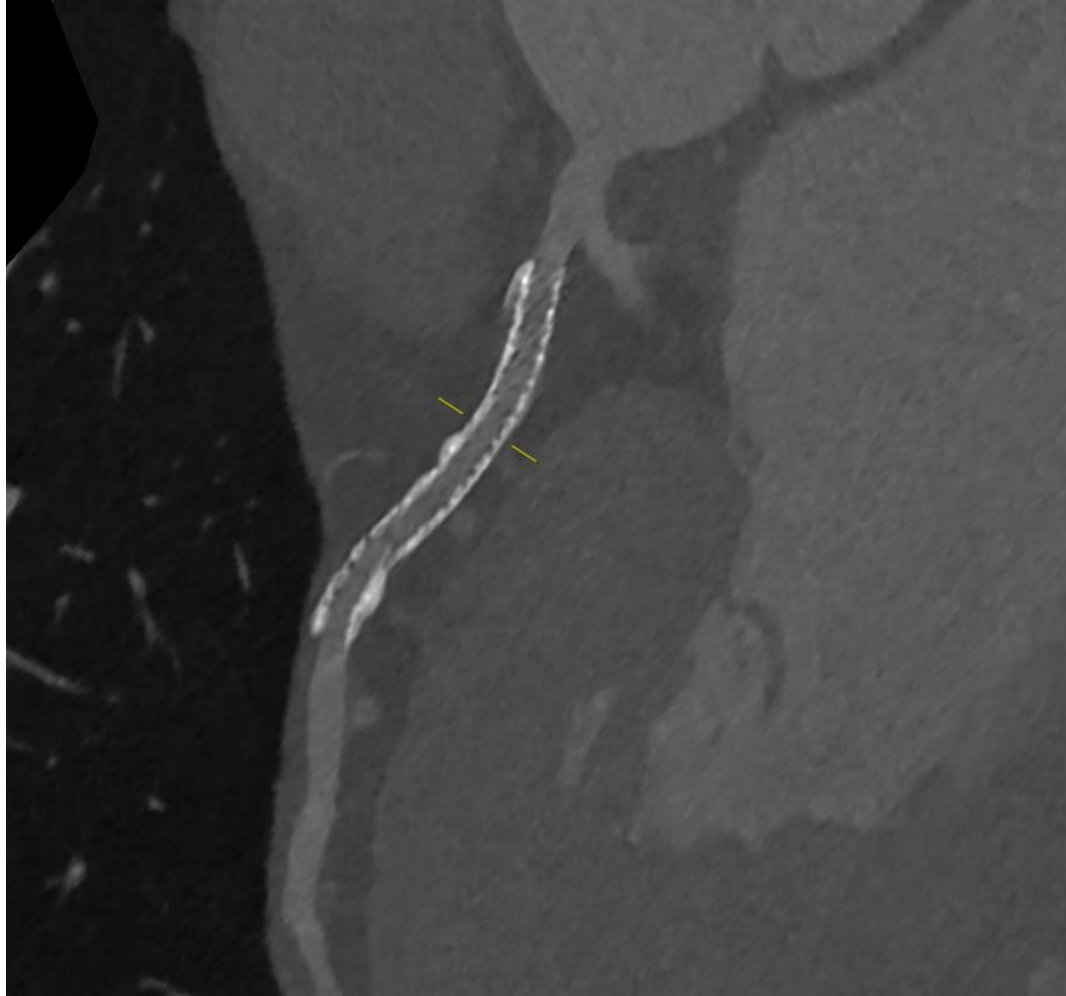
UHR EVEN AT HIGH / UNSTABLE HEART



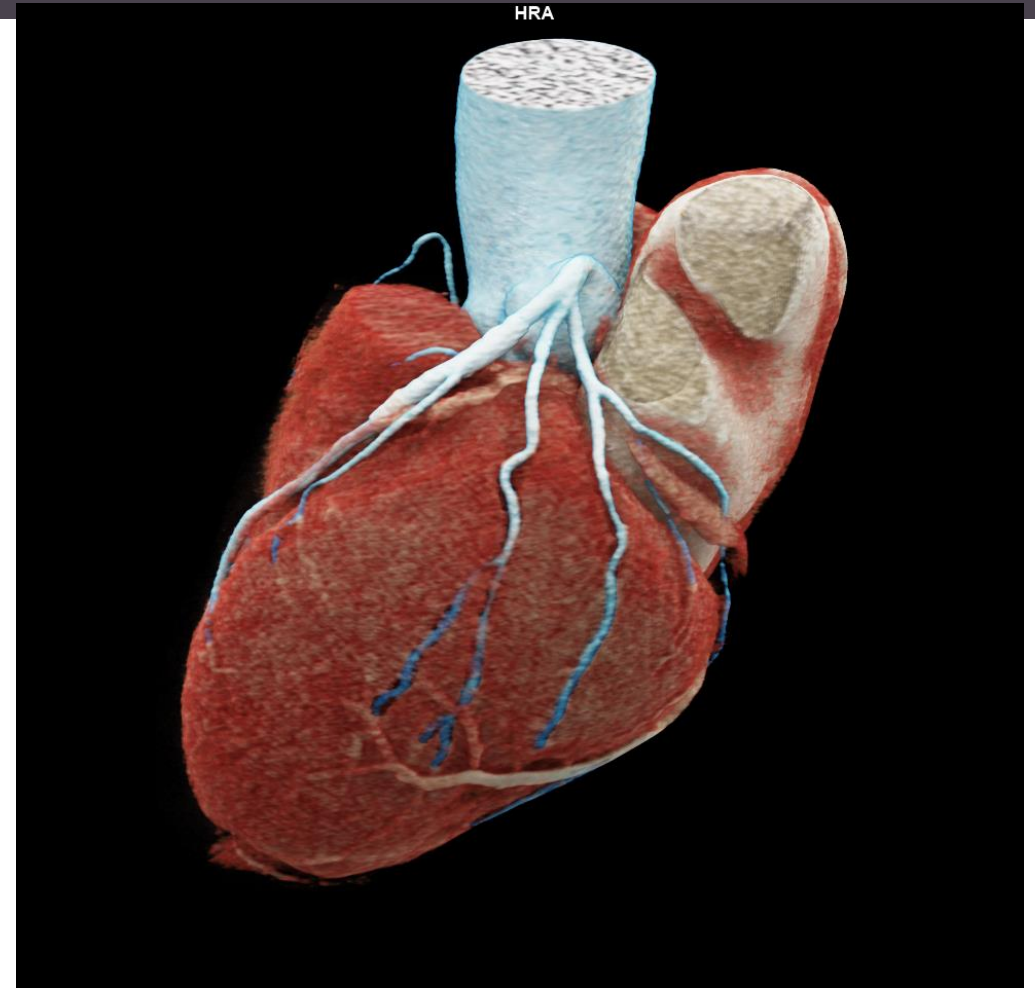
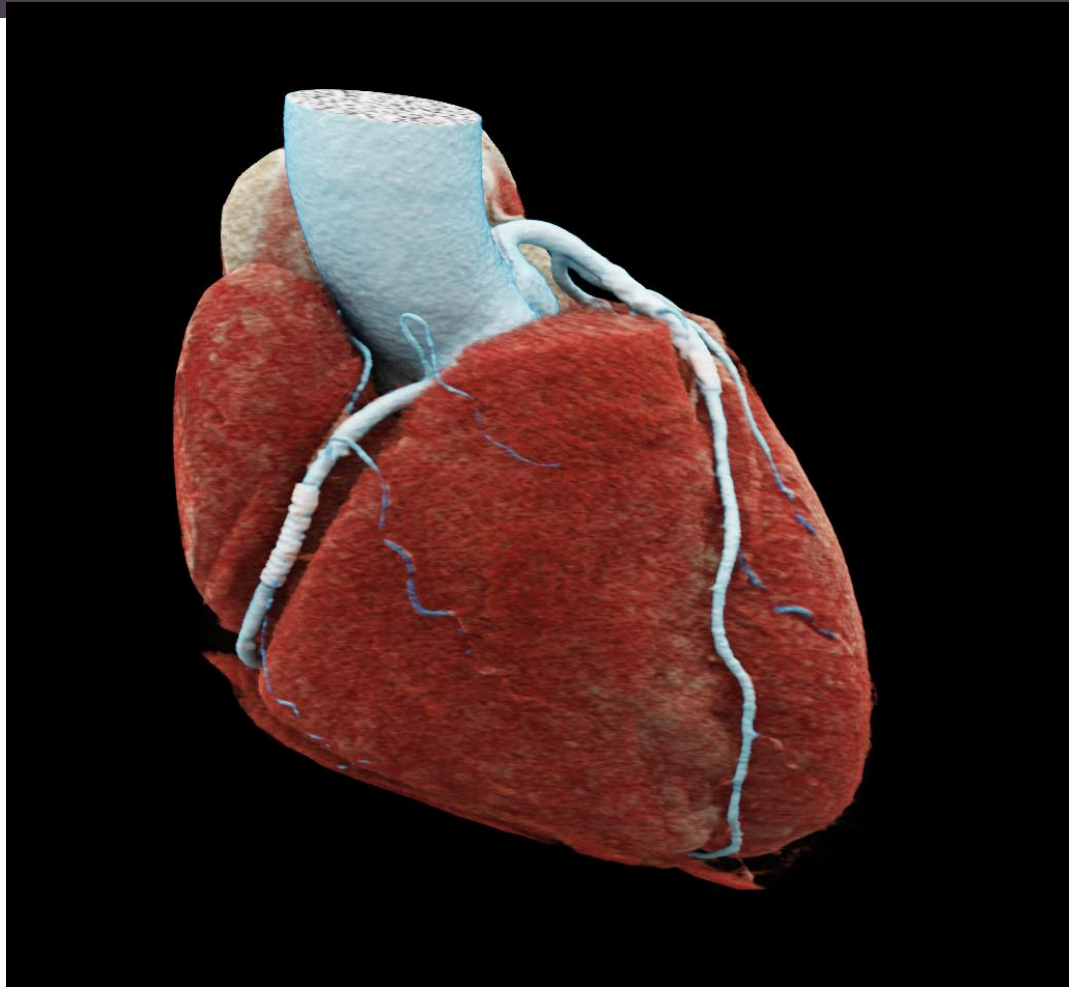
UHR Acquisition
Spiral Acquisition 120Kv
2,4 cm detector coverage
0,2mm/0,2 mm Reconstruction

UHR EVEN AT HIGH / UNSTABLE HEART RYTHM

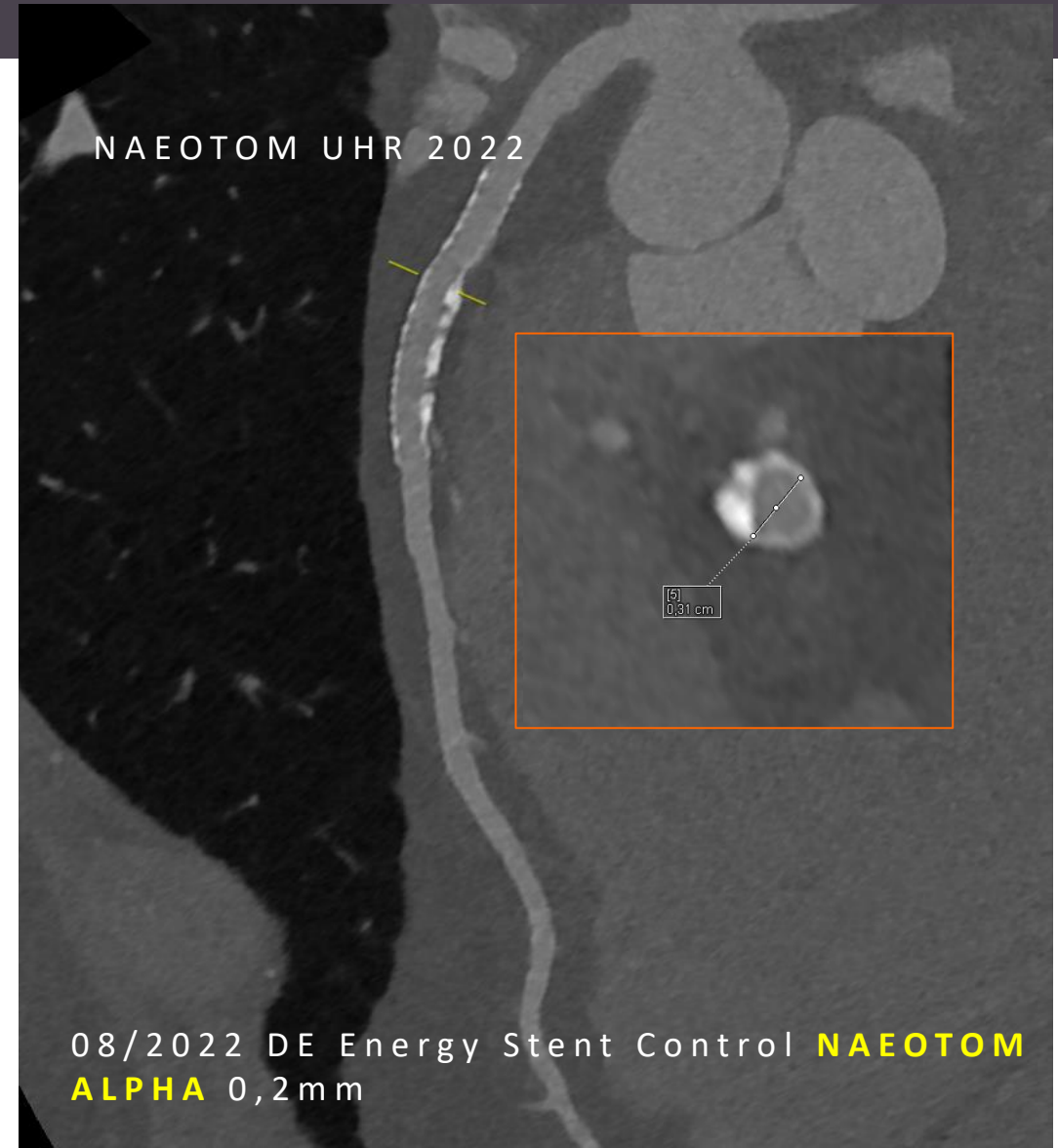
Active Synergy stent 3.0x38 mm



STENT UHR Versus FORCE



STENT UHR Versus FORCE

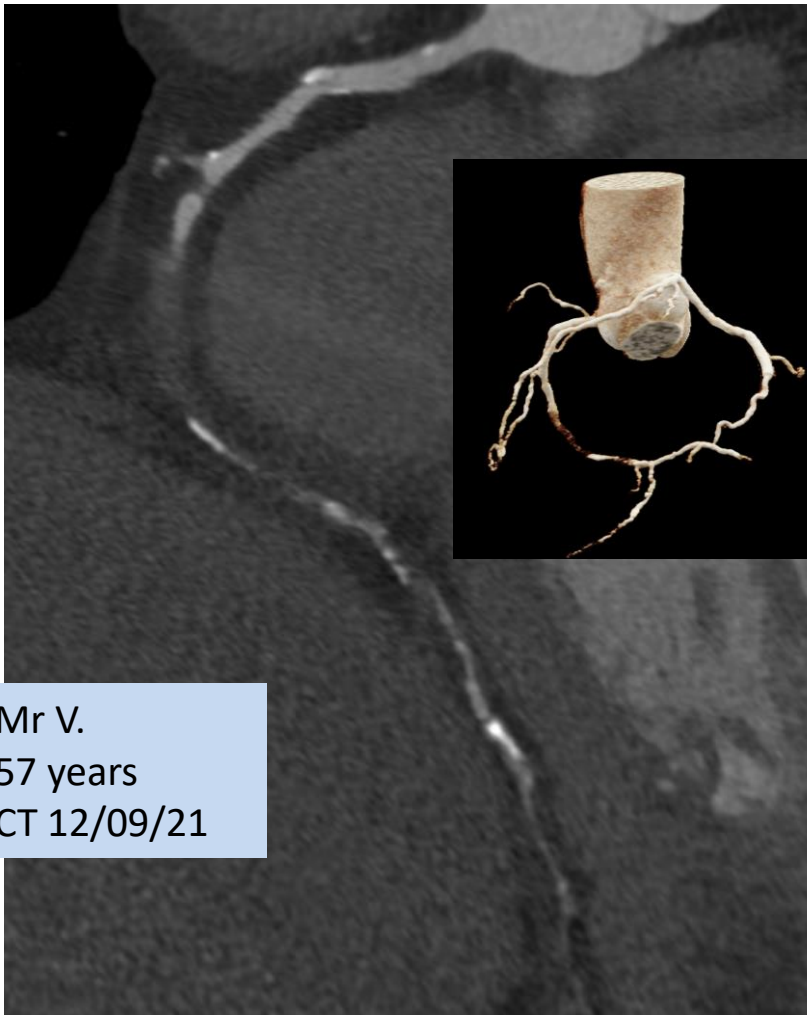


UHR CARDIAC SCAN LIMITATIONS

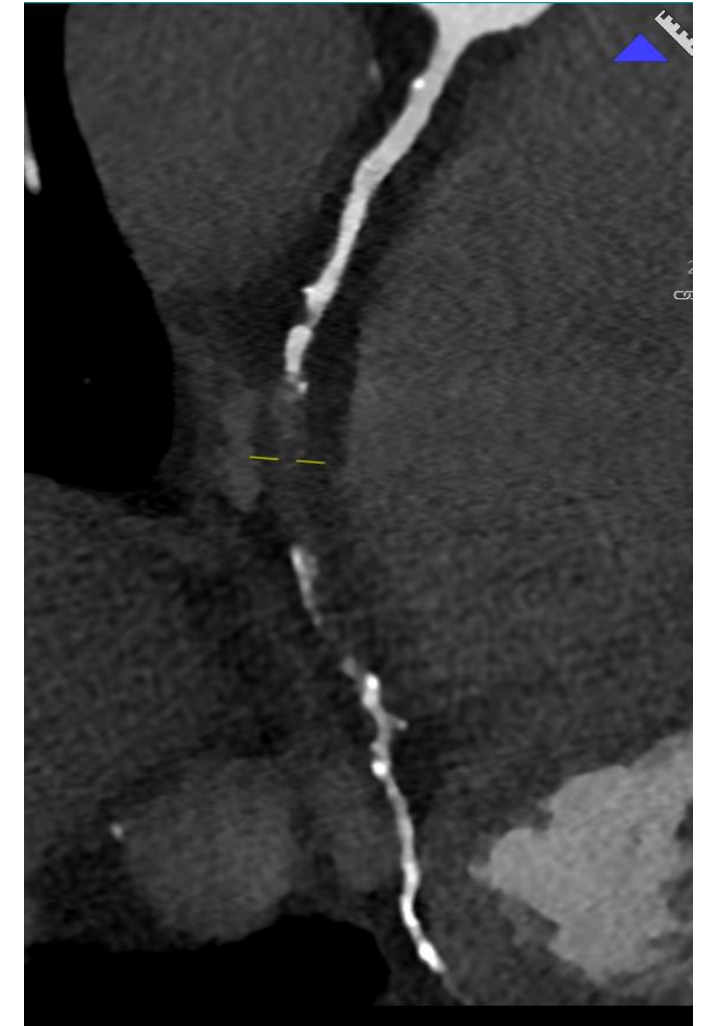
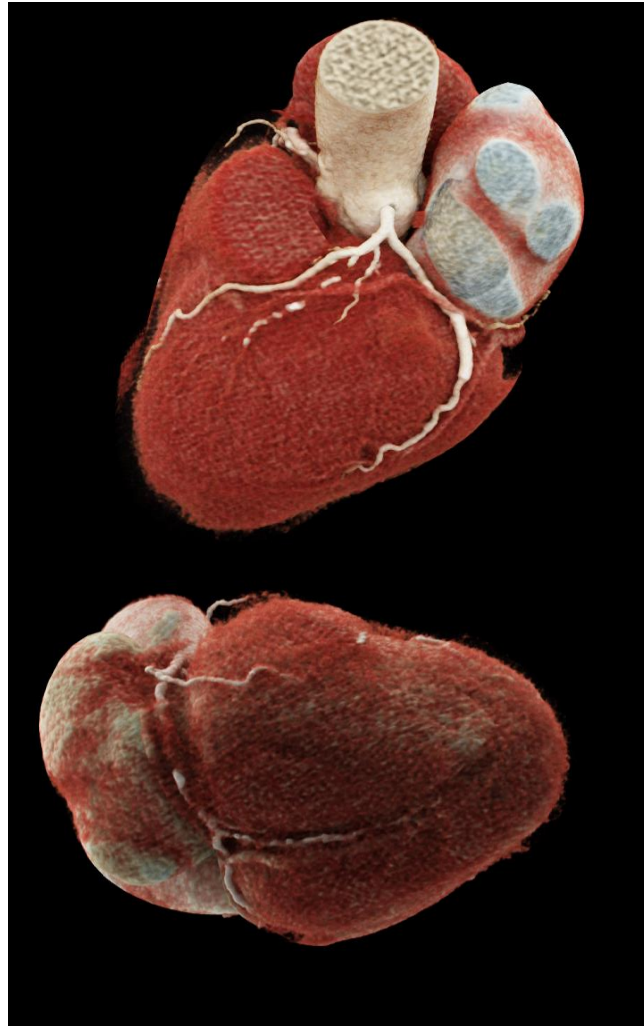
- No spectral data
- No turbo flash acquisition
- Reduced z axis coverage (120x0,2mm) 24mm instead of (144x0,4mm) 57mm
- Longer acquisition time eg +/- 10s
- Clinical dedicated scan: only stent study
- Increased raw data size(60 Gb)

CTO

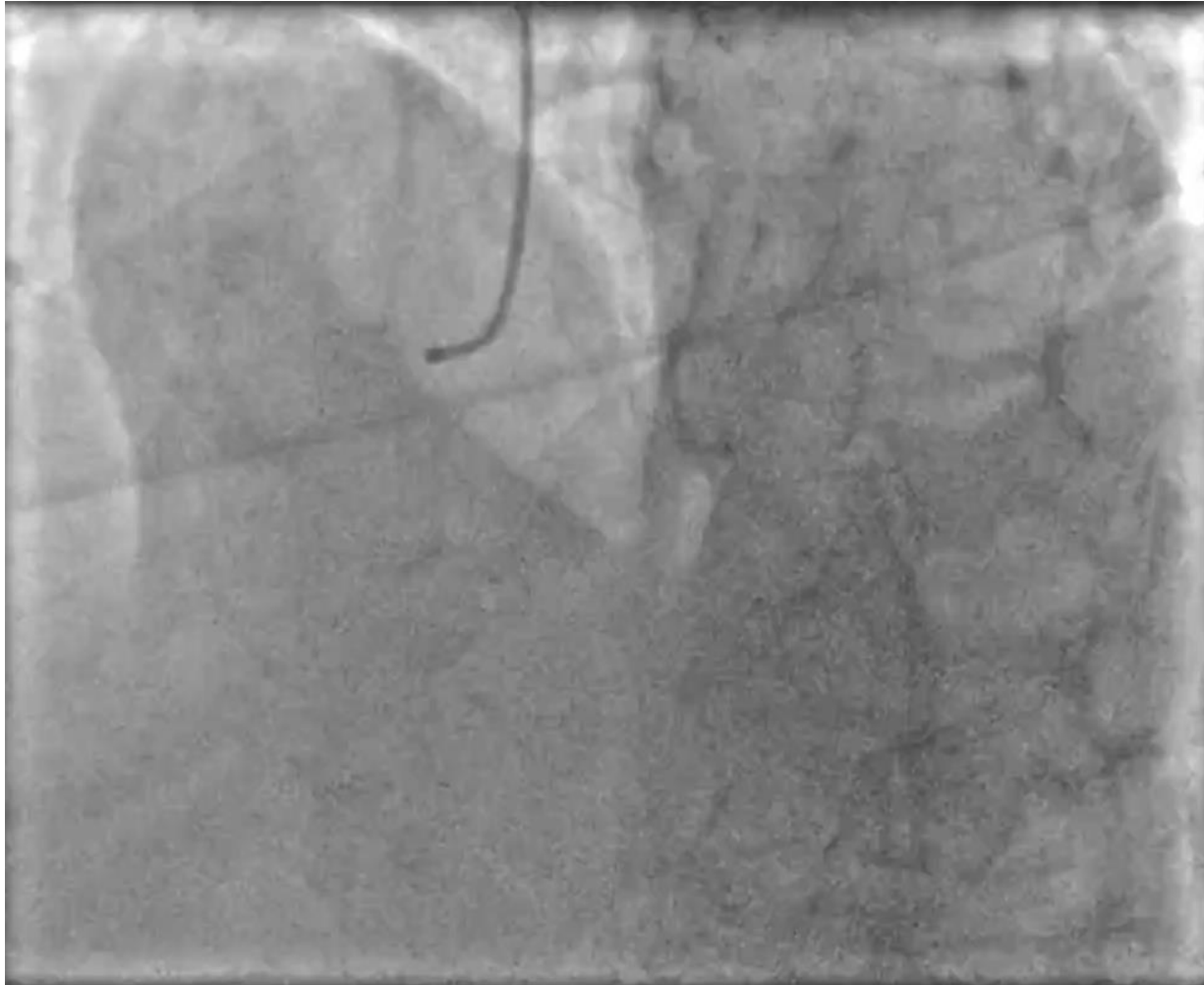
Better visualization of RCA distal Run-off (not assessed by XA) by different Energy levels



RCA 70 Kev



Mr B.
78 years
XA 09/16/21



Mr B.
78 years
CT Scan 10/14/21

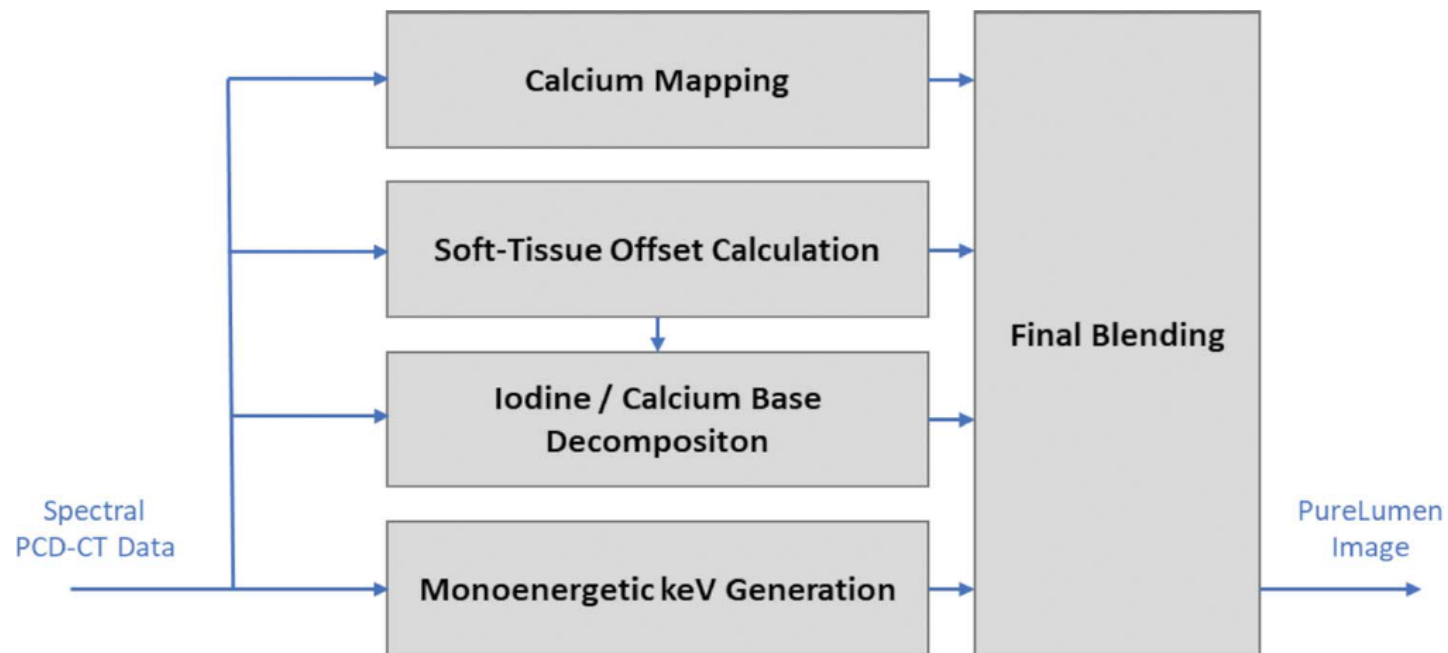


From visual assessment to quantitative analysis

PURE LUMEN

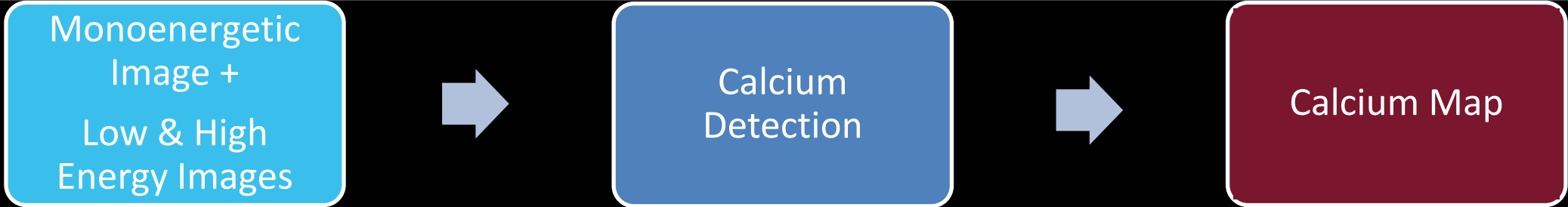
PURE LUMEN : basic principe

The aim of the Pure Lumen algorithm is the reconstruction of images, which omit all contributions from calcium or bone-like material from the final image, while leaving all other material values unchanged with respect to their HU values

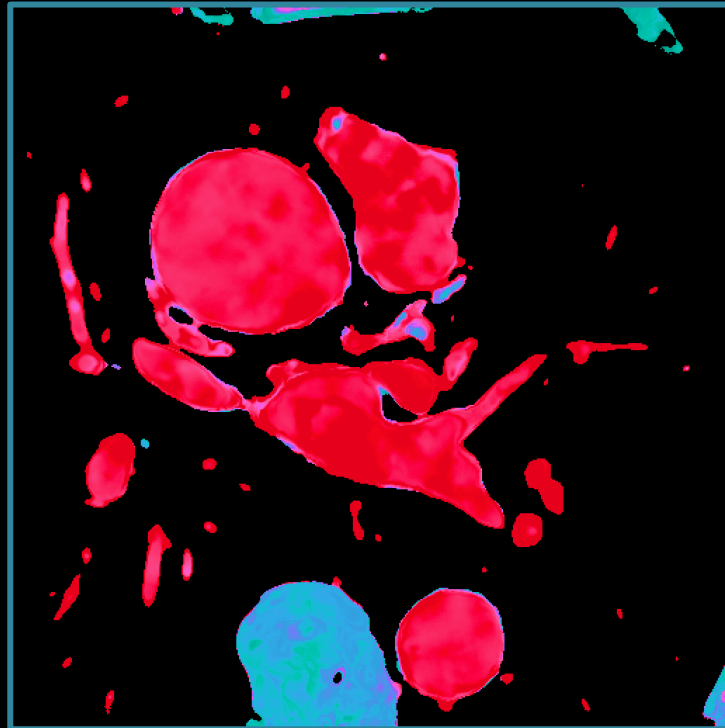


@Thomas Allmendinger &all Investigate Radiology 2022

PURE Lumen - Algorithm

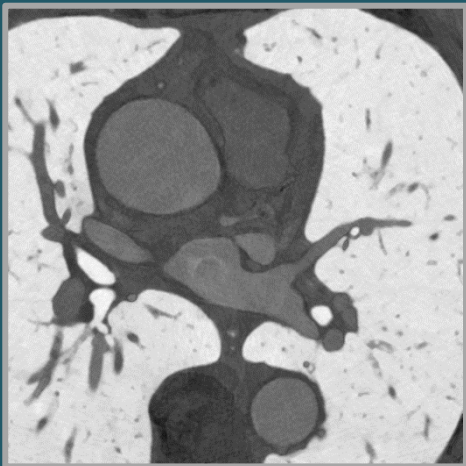


C: 400 W: 1200



PURE Lumen - Algorithm

Material Decomposed Iodine Image

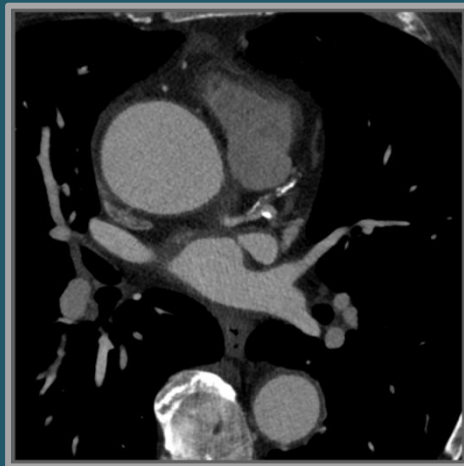


C: 400 W: 1200

Calcium Map



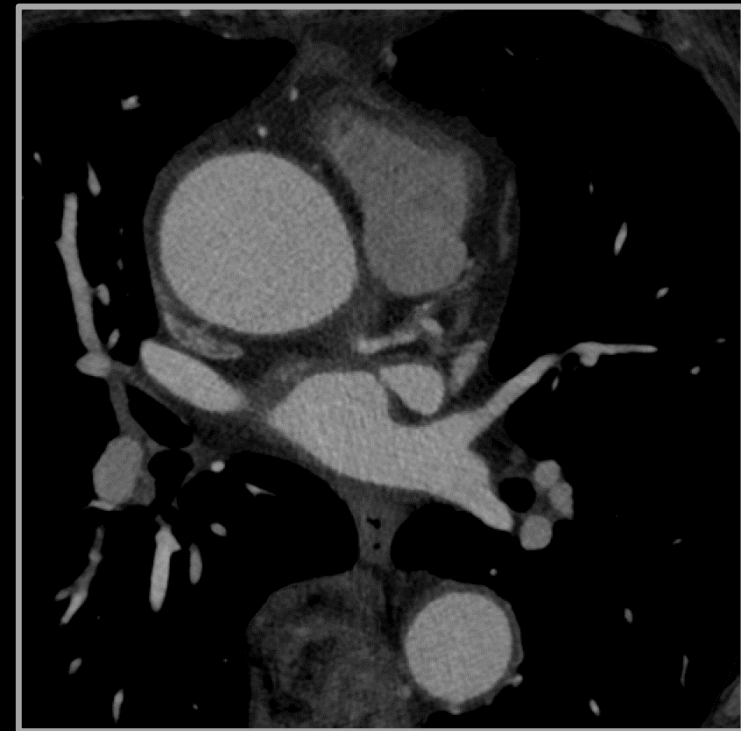
Mono Image



C: 400 W: 1200



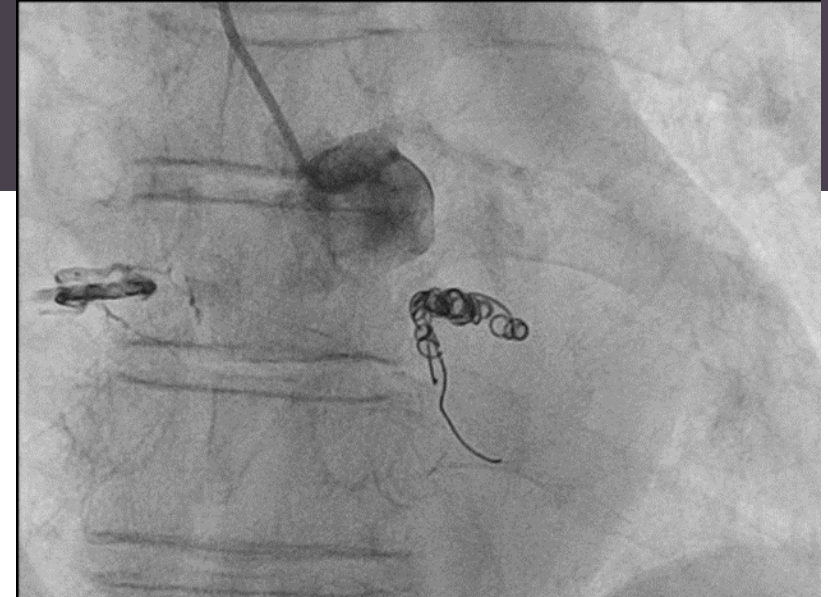
Calcium-Removed Monoenergetic Image



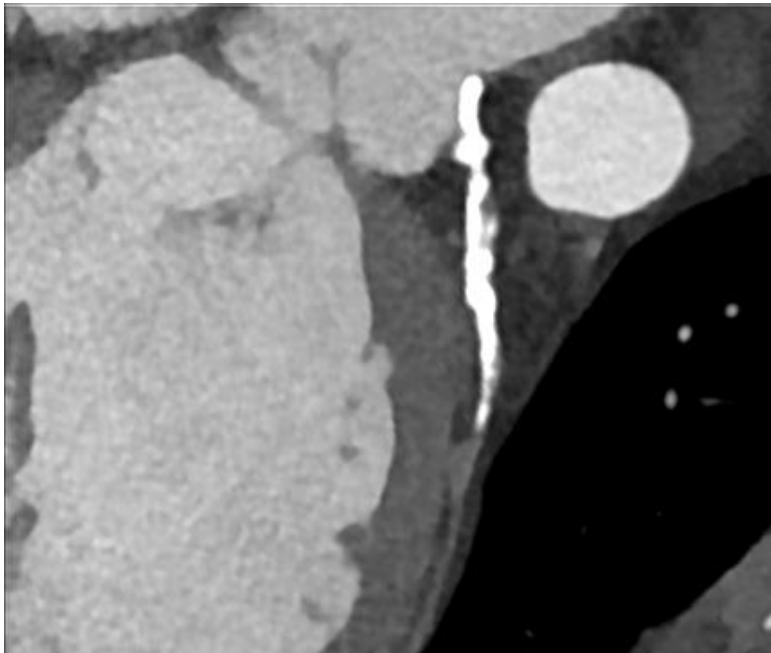
C: 400 W: 1200

Mr .C
80 years
Patient scheduled for surgical revascularization
Evaluation of LAD distal run-off

XA



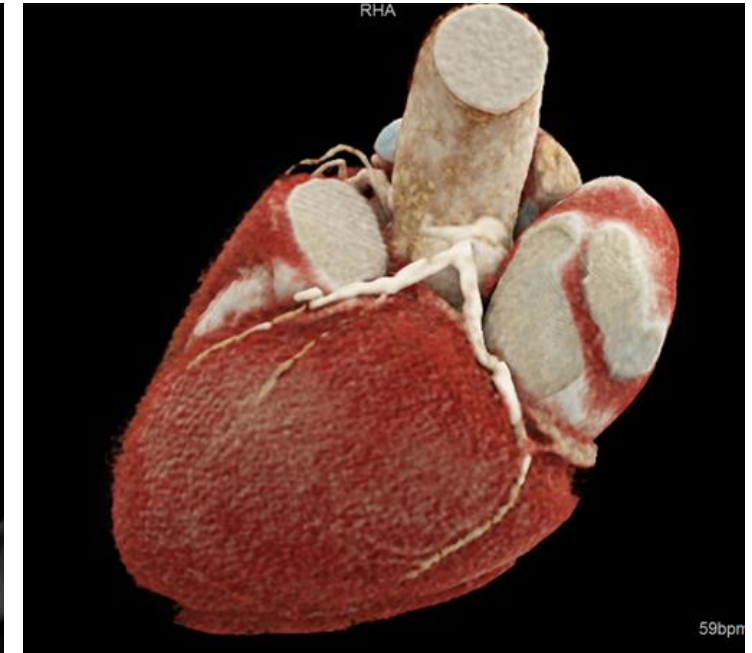
70 KEV



70 KEV Pure Lumen

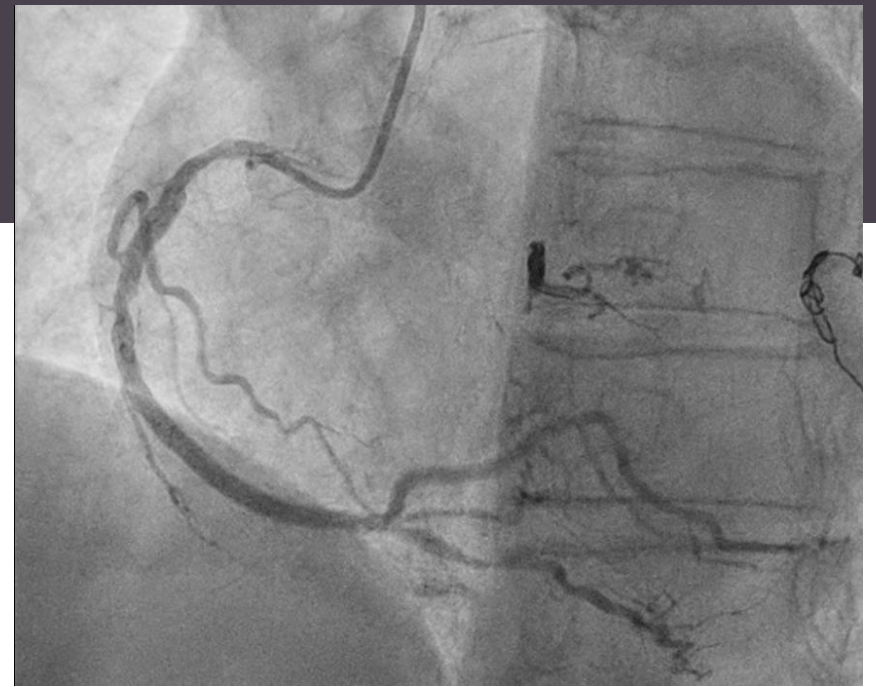


Cinematic Rendering



Mr .C
80 years
Patient scheduled for surgical revascularization
Evaluation of RCA

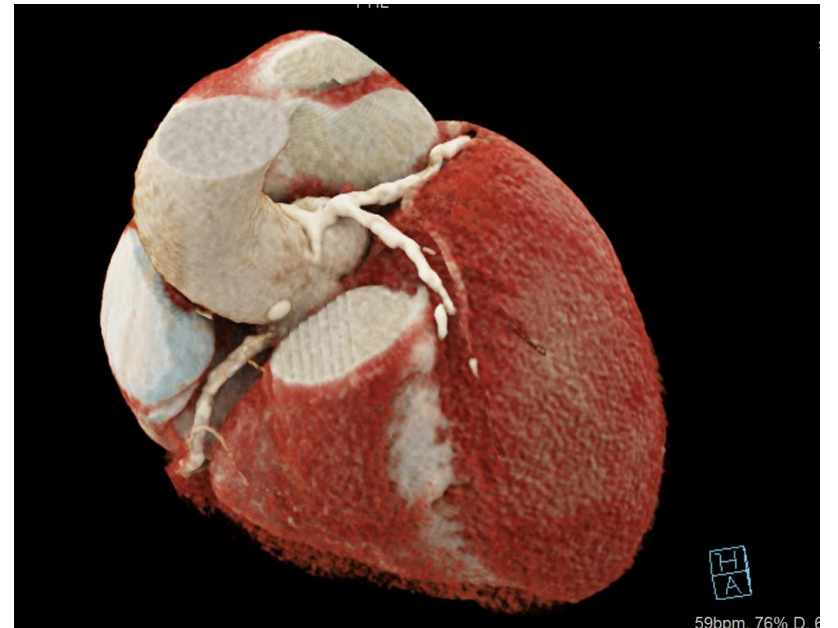
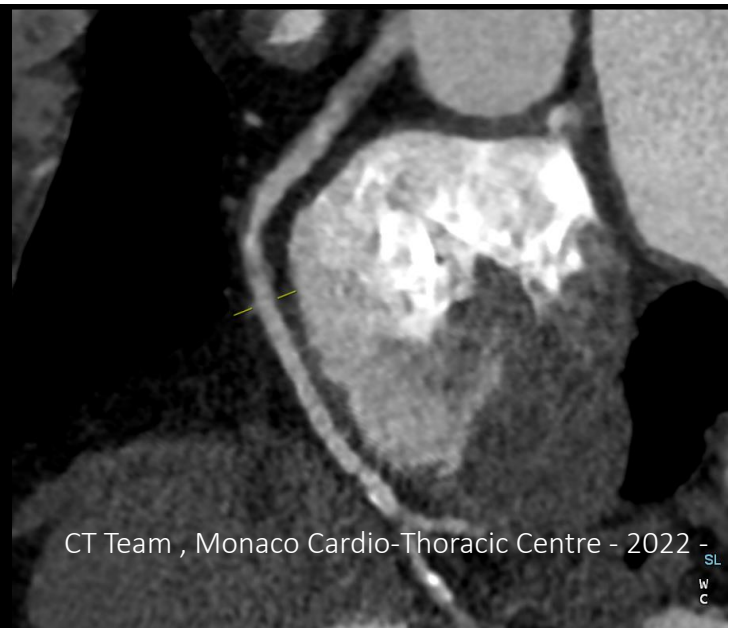
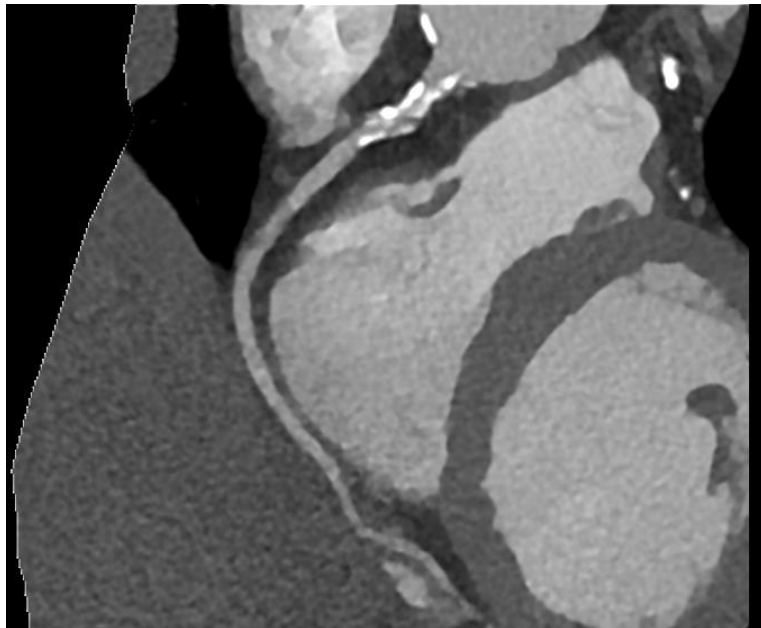
X A



70 KEV

70 KEV Pure Lumen

Cinematic Rendering



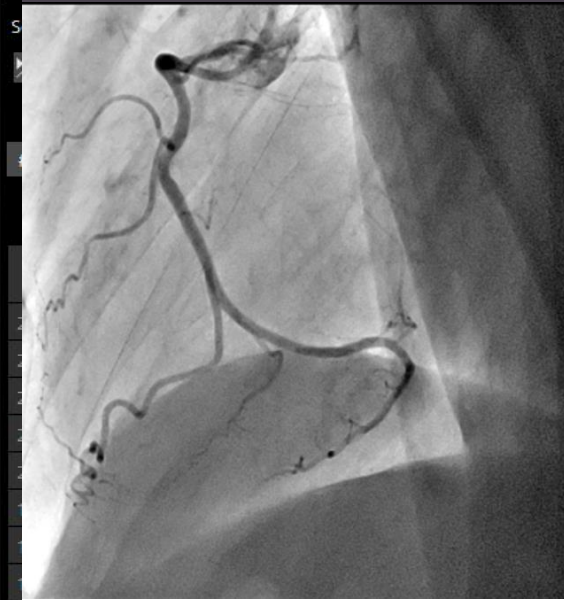
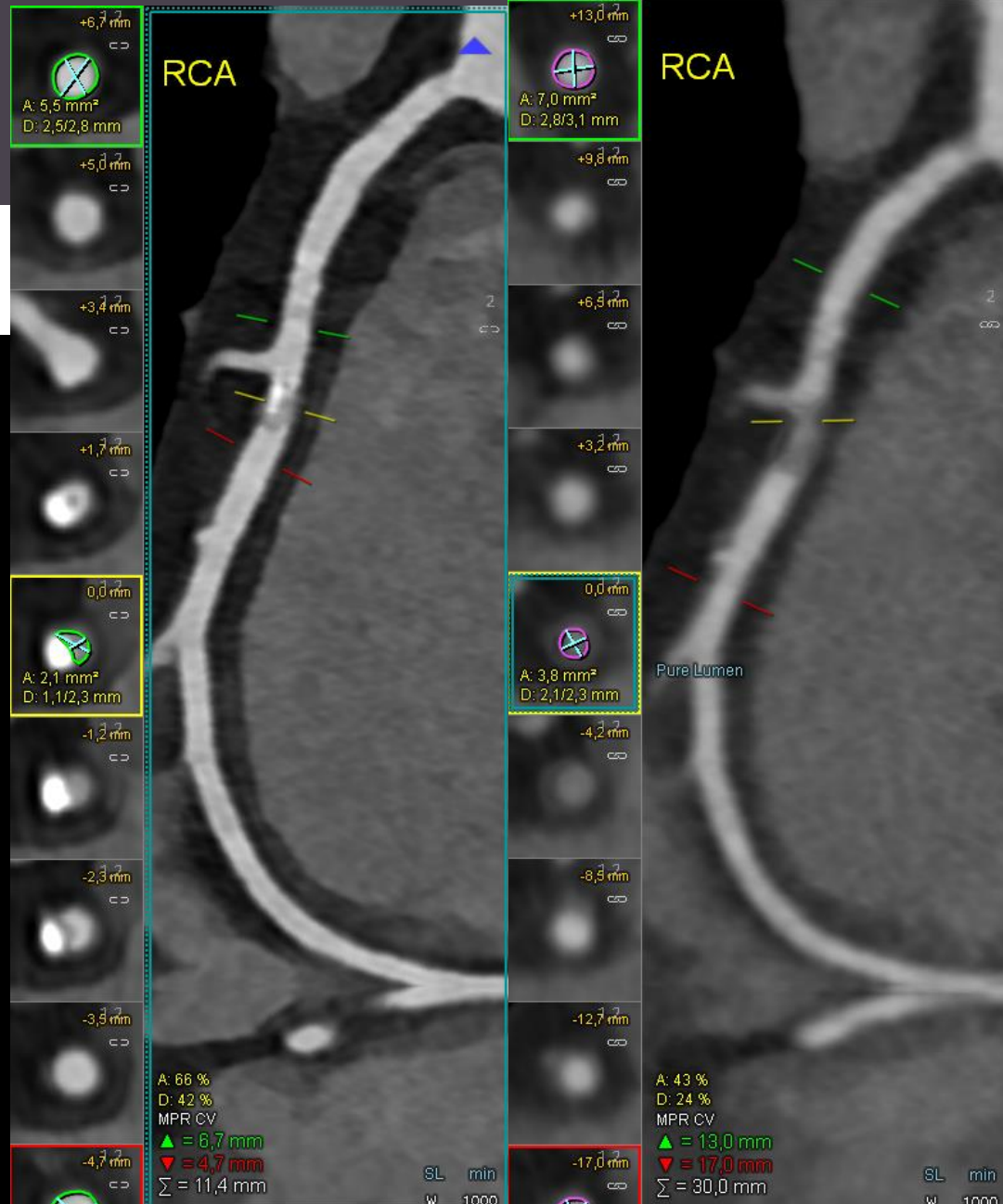
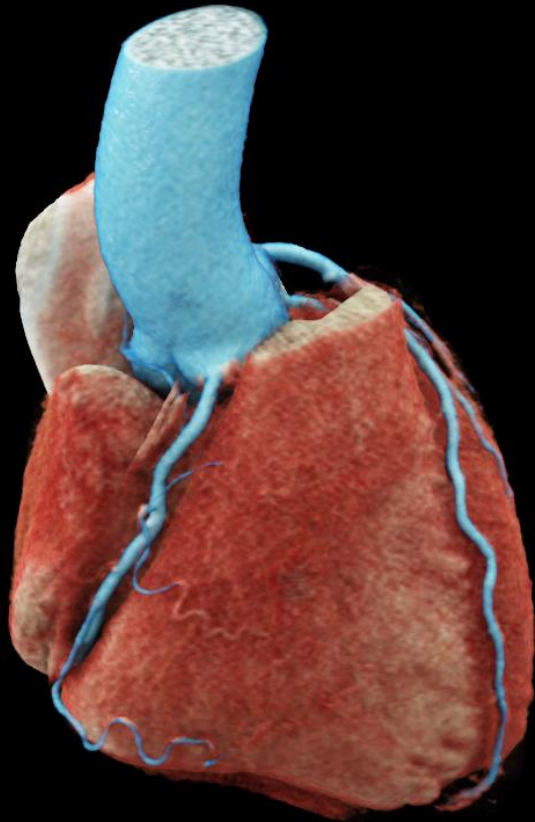
Mr CHA. R ...73 years
CT Scan 09/23/2021

Asymptomatic
Patient
Risk factors
Family story



Mr RIQ....68 years
CT Scan 07/22/2022

Asymptomatic
Patient
Chest pain during
stress test



Immediate XA control



Pure Lumen QR 44 0,4

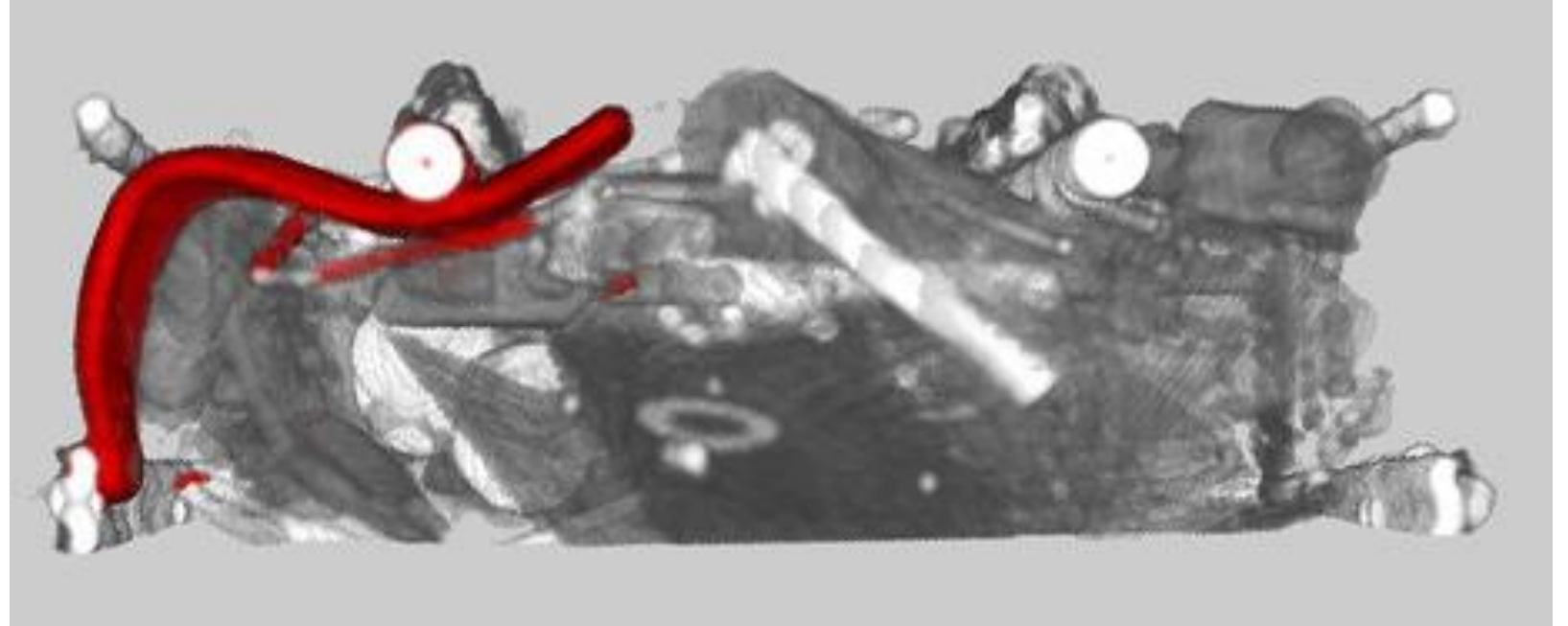
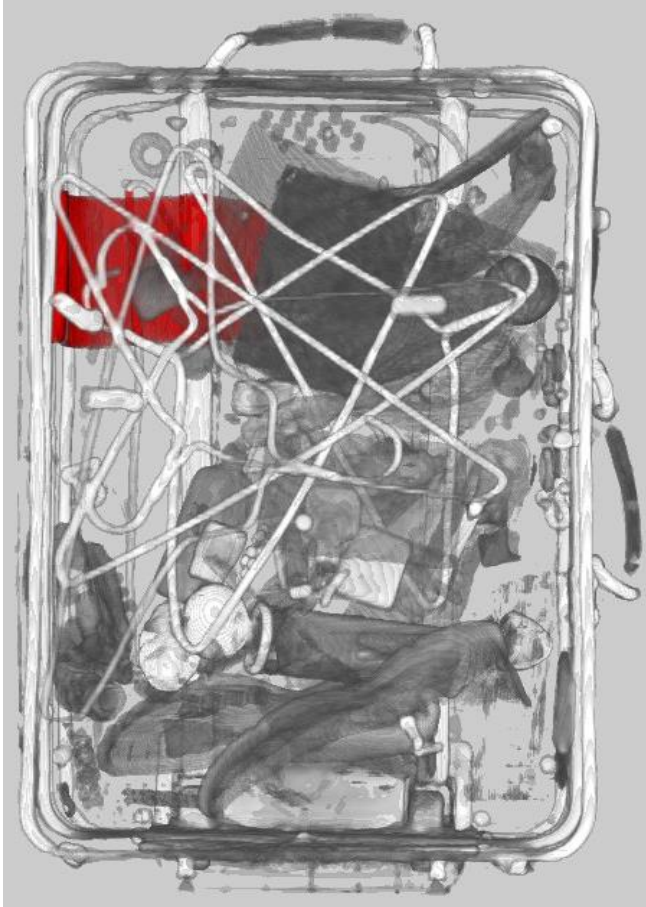
Spiral Scan BV44 0,4/0,2

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SPECTRAL ANALYSIS

Dual Energy imaging a long story

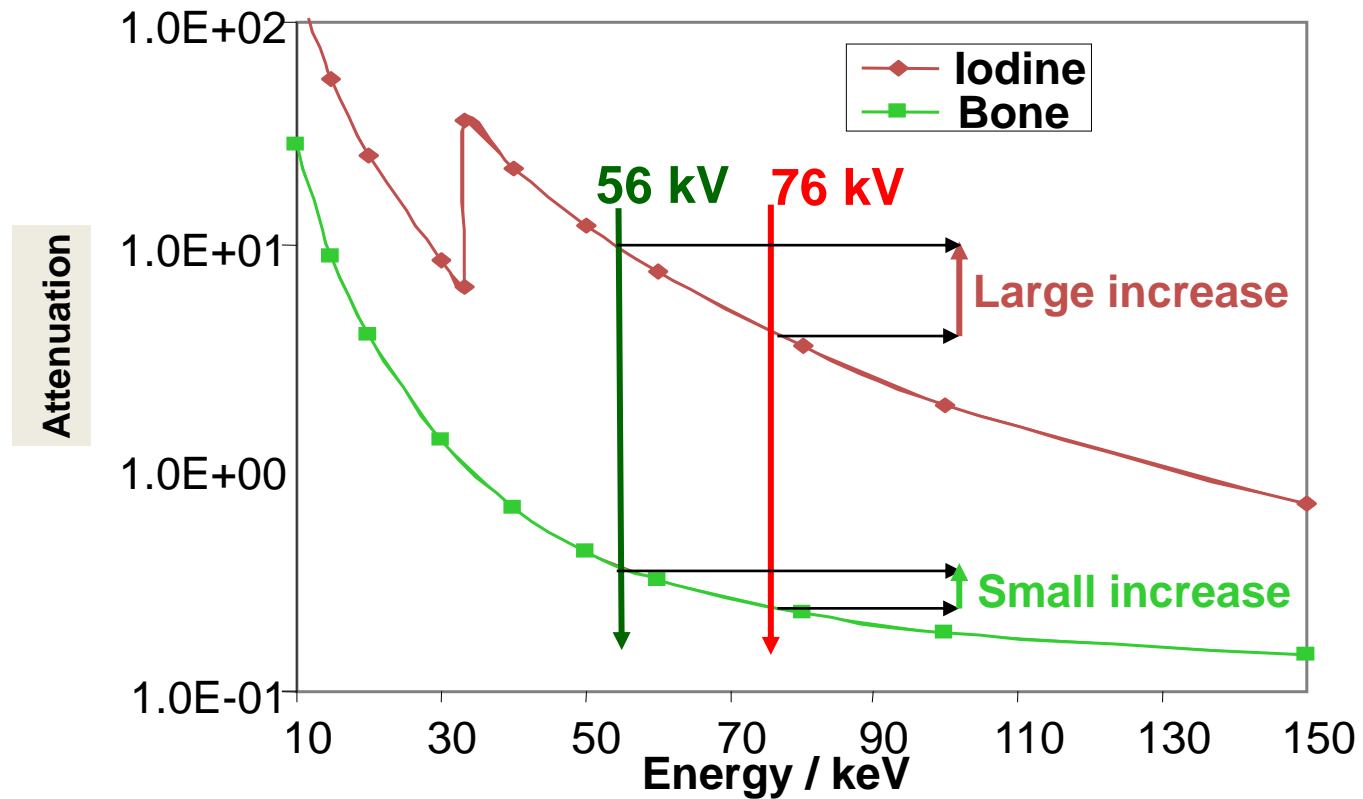
Material Specific Parameters: Atomic Number and Density
Useful in NDT, explosives tend to have high density but low atomic number



Images courtesy of Carl Crawford and Zhengrong Ying, Analogic

Principle of Spectral imaging CT

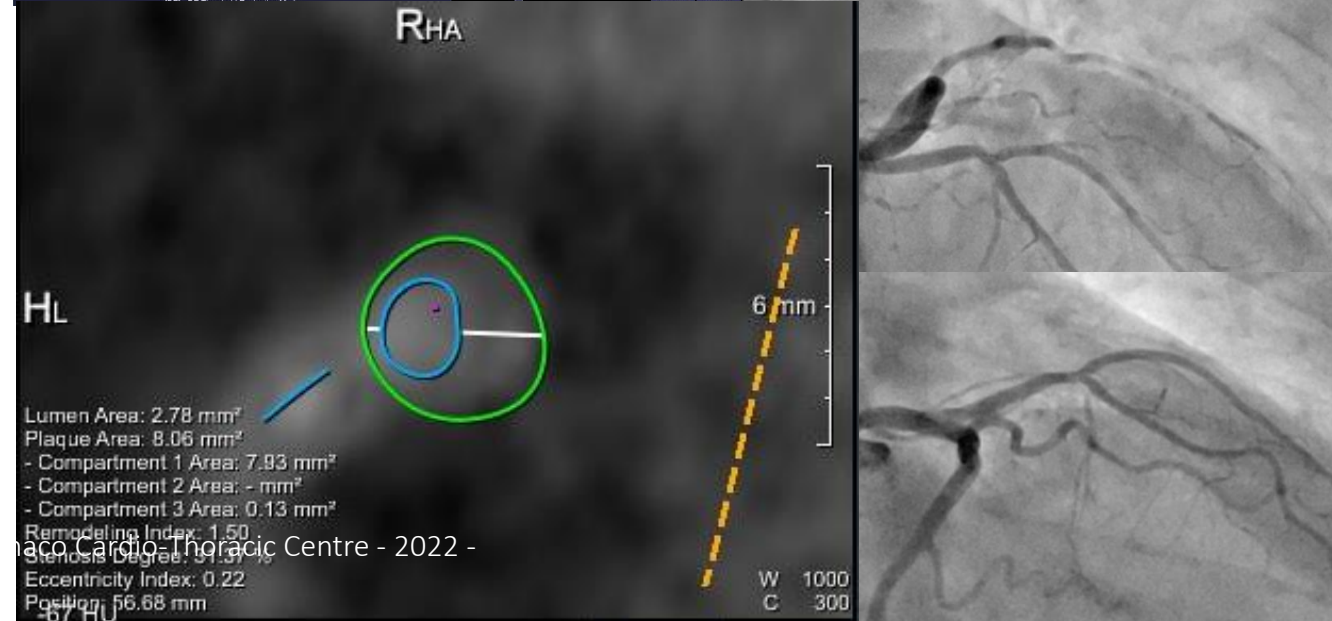
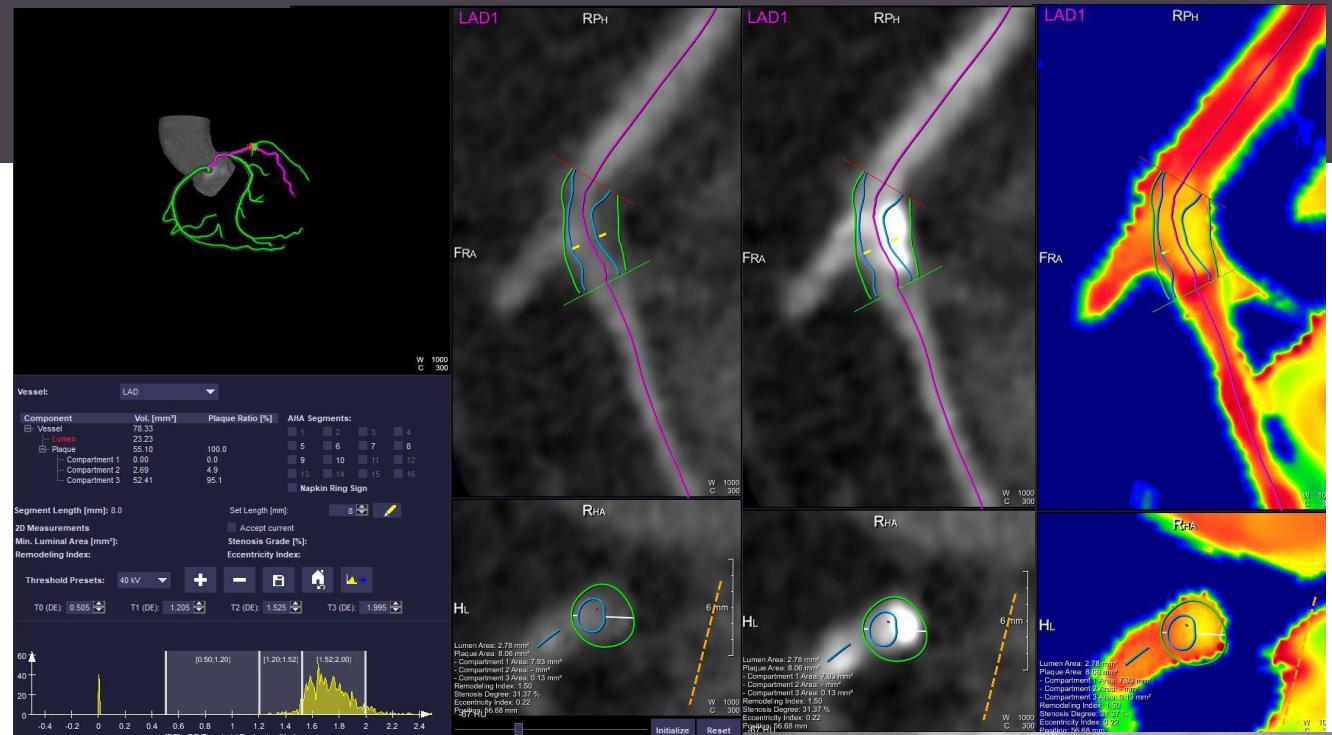
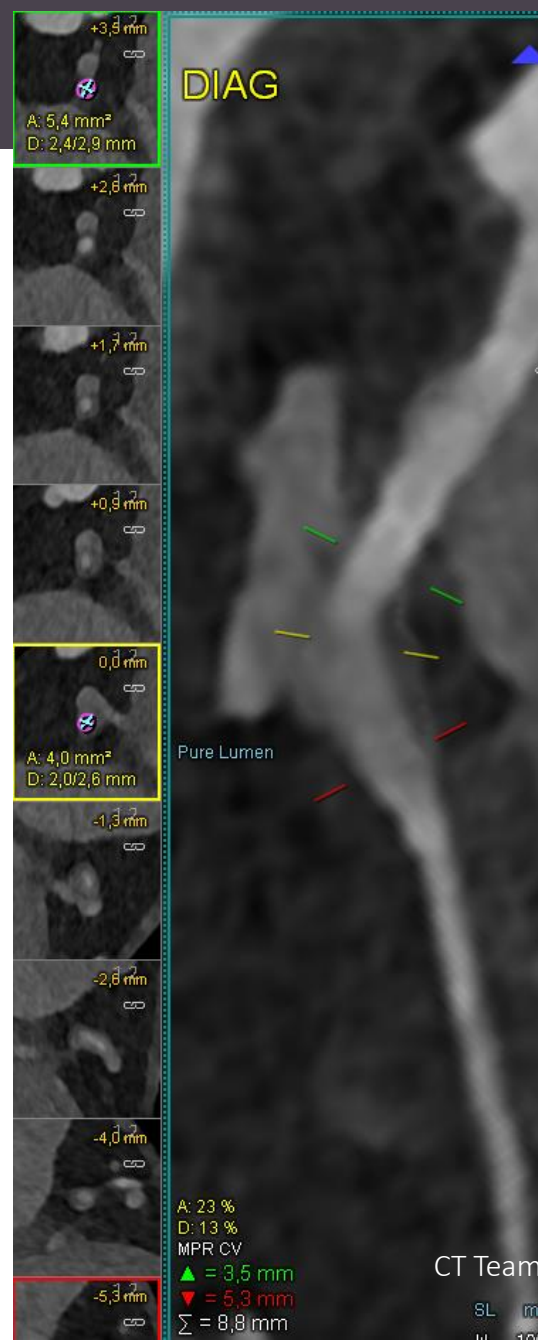
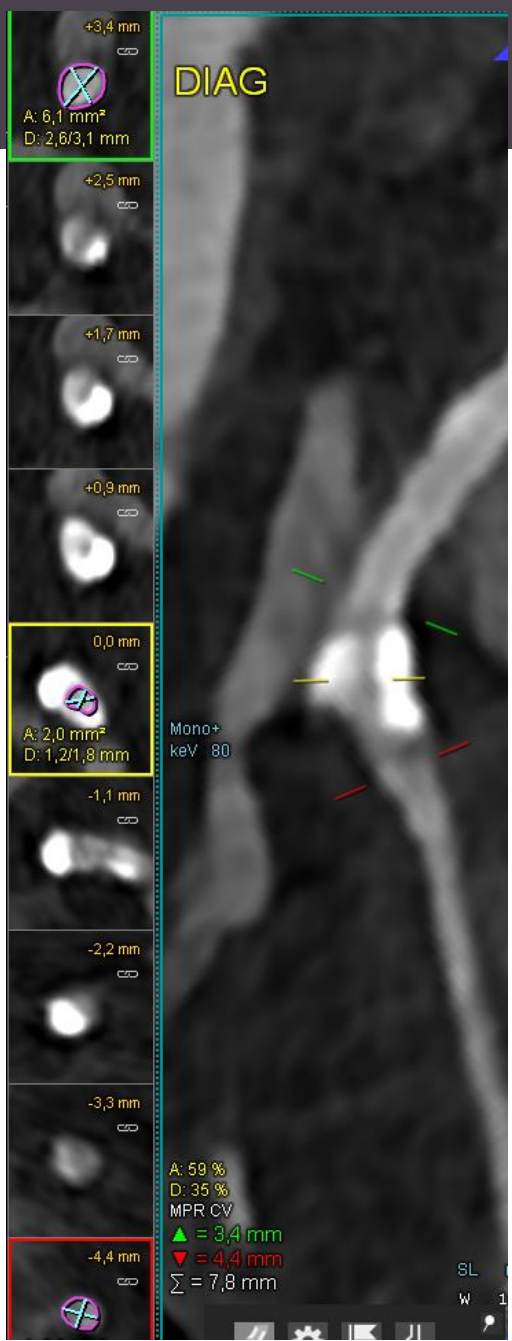
Many materials show different attenuation at different mean energies

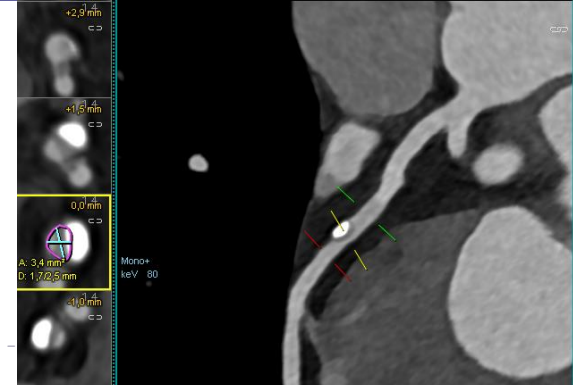
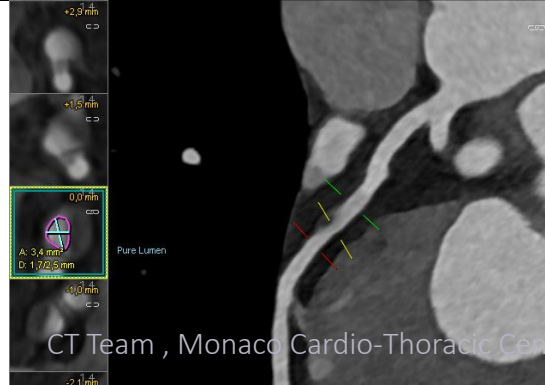
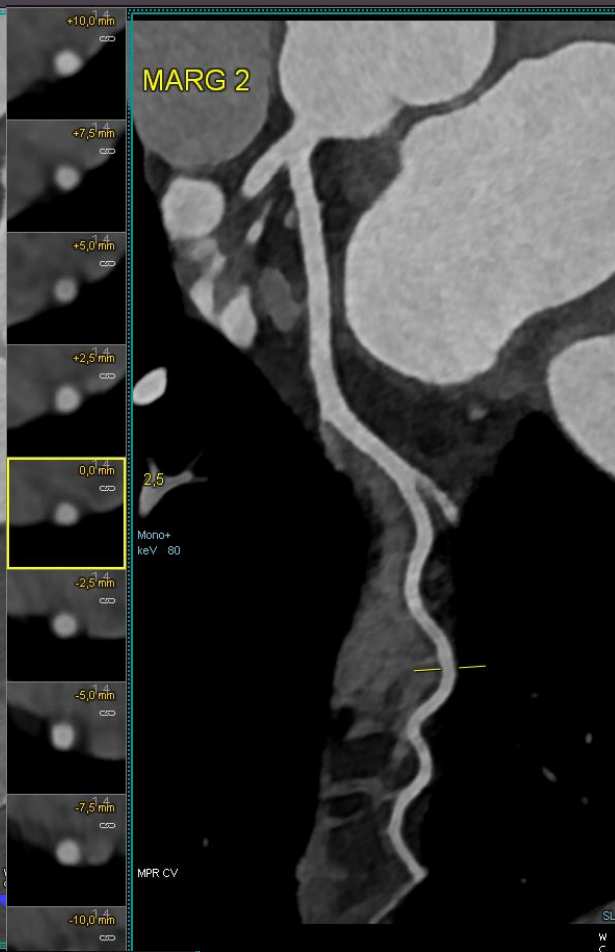
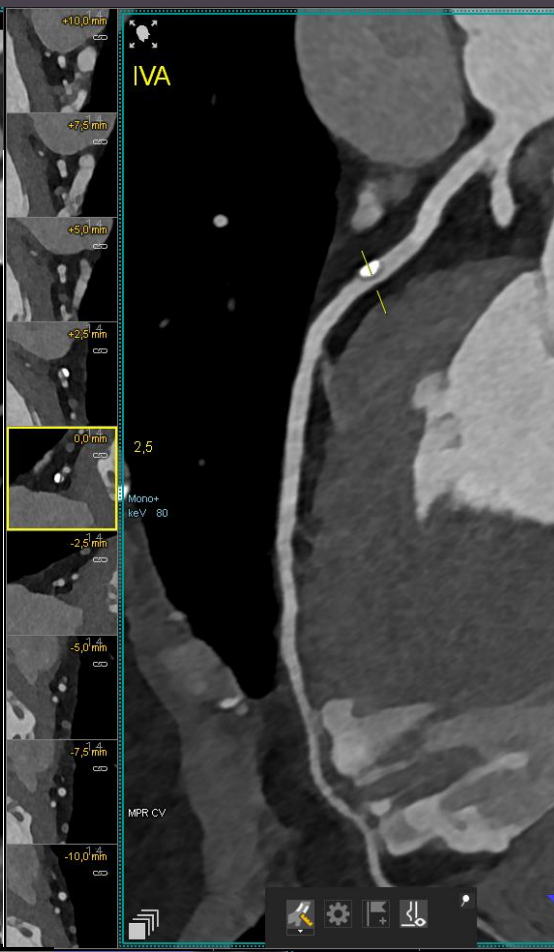
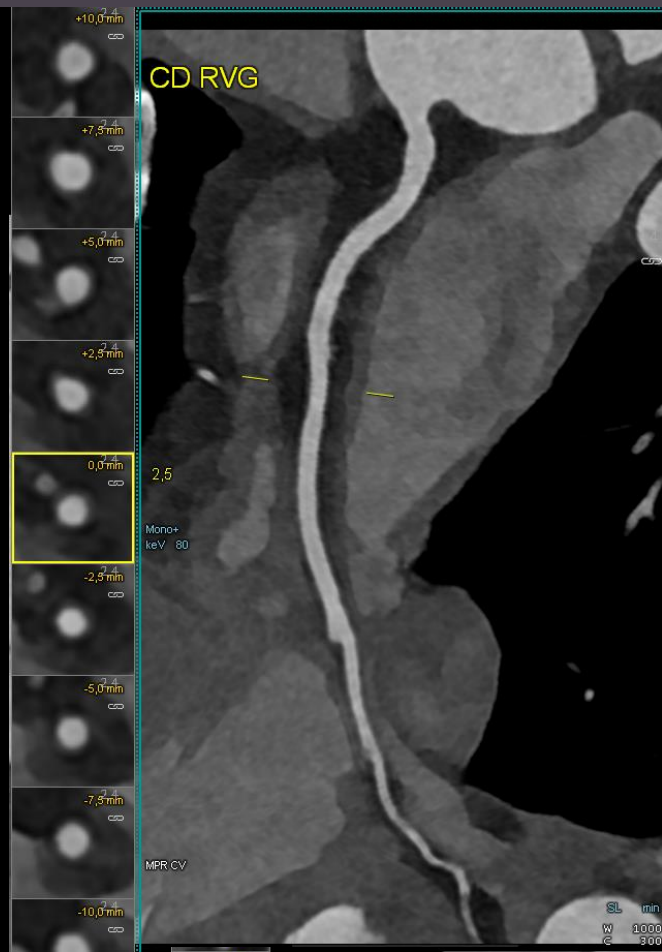
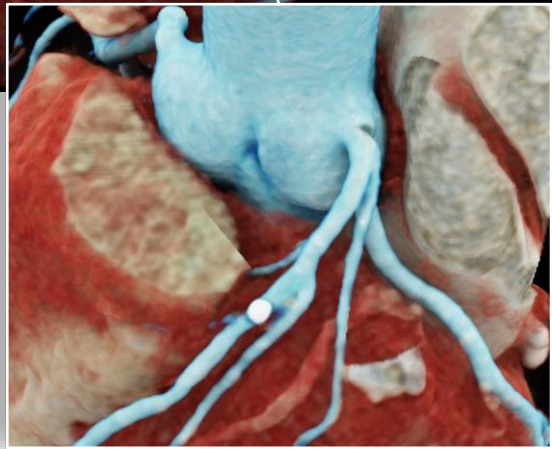
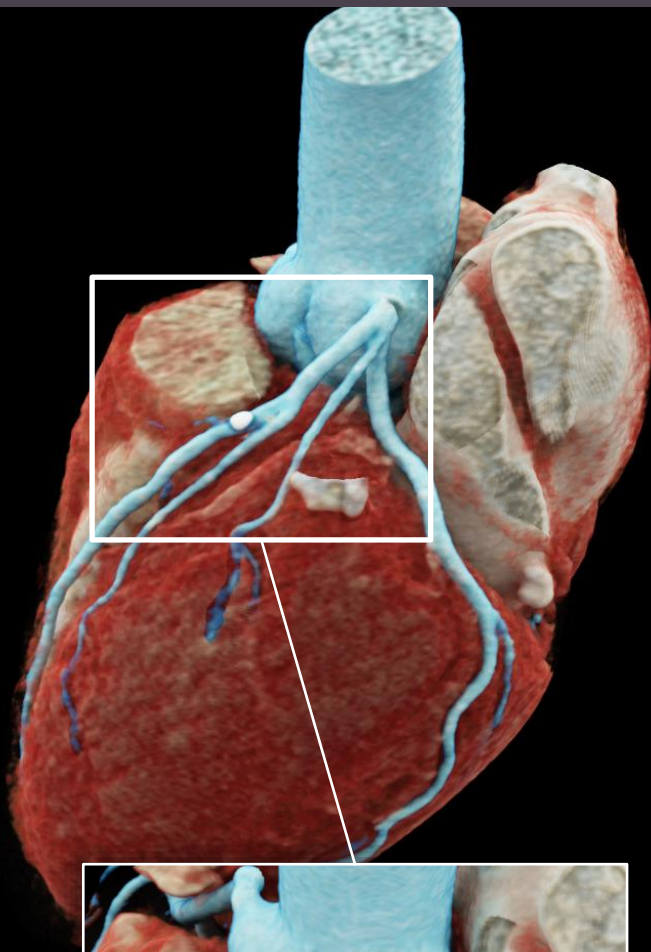


Plaque analysis

Reason: different attenuation mechanisms: Compton vs photo effect

Case Mrs RI.. Plaque «cartography» based on different attenuation ratio





Vessel: LAD

Component	Vol. [mm ³]	Plaque Ratio [%]	AHA Segments:
Vessel	126.81		<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4
Lumen	74.64		<input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8
Plaque	52.17	100.0	<input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11 <input type="checkbox"/> 12
Compartment 1	0.00	0.0	<input type="checkbox"/> 13 <input type="checkbox"/> 14 <input type="checkbox"/> 15 <input type="checkbox"/> 16
Compartment 2	4.49	8.6	<input type="checkbox"/> Napkin Ring Sign
Compartment 3	47.68	91.4	

Segment Length [mm]: 13.7 Set Length [mm]: 13.7

2D Measurements
 Min. Luminal Area [mm²]: Stenosis Grade [%]:
 Remodeling Index: Eccentricity Index:

Threshold Presets: V0 HU + - [] [] []

T0 (DE): 0.505 T1 (DE): 1.005 T2 (DE): 1.485 T3 (DE): 2.075

[DE] - DE Threshold Evaluation Mode

LAD1 HRP

RF

W 1106 C 459

H

LP

Lumen Area: 3.16 mm²
 Plaque Area: 7.13 mm²
 - Compartment 1 Area: 4.88 mm²
 - Compartment 2 Area: - mm²
 - Compartment 3 Area: 1.12 mm²
 Remodeling Index: 1.24
 Stenosis Degree: 25.55 %
 Eccentricity Index: 0.20
 Position: 46.28 mm

W 1106 C 459

Initialize Reset

LAD1 HRP

RF

W 1106 C 459

H

LP

Lumen Area: 3.16 mm²
 Plaque Area: 7.13 mm²
 - Compartment 1 Area: 4.88 mm²
 - Compartment 2 Area: - mm²
 - Compartment 3 Area: 2.25 mm²
 Remodeling Index: 1.24
 Stenosis Degree: 25.55 %
 Eccentricity Index: 0.20
 Position: 46.28 mm

W 1106 C 459

LAD1 HRP

RF

W 1106 C 459

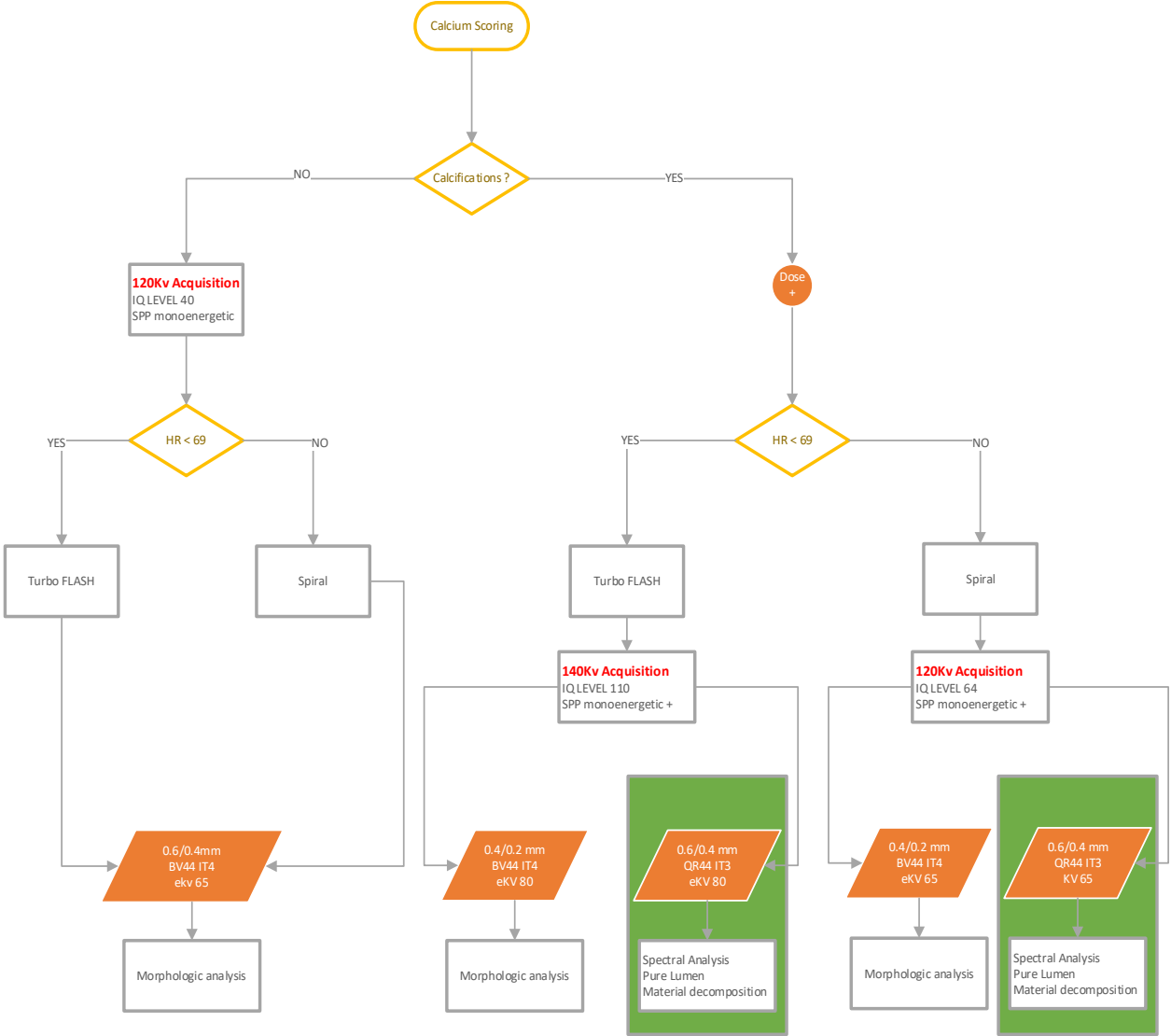
H

LP

Lumen Area: 3.16 mm²
 Plaque Area: 6.99 mm²
 - Compartment 1 Area: 5.87 mm²
 - Compartment 2 Area: - mm²
 - Compartment 3 Area: 1.12 mm²
 Remodeling Index: 1.24
 Stenosis Degree: 25.55 %
 Eccentricity Index: 0.20
 Position: 46.28 mm

W 1106 C 459

DECISION TREE FOR CARDIAC ACQUISITION



From Hu Voxel Segmentation to Spectral Analysis



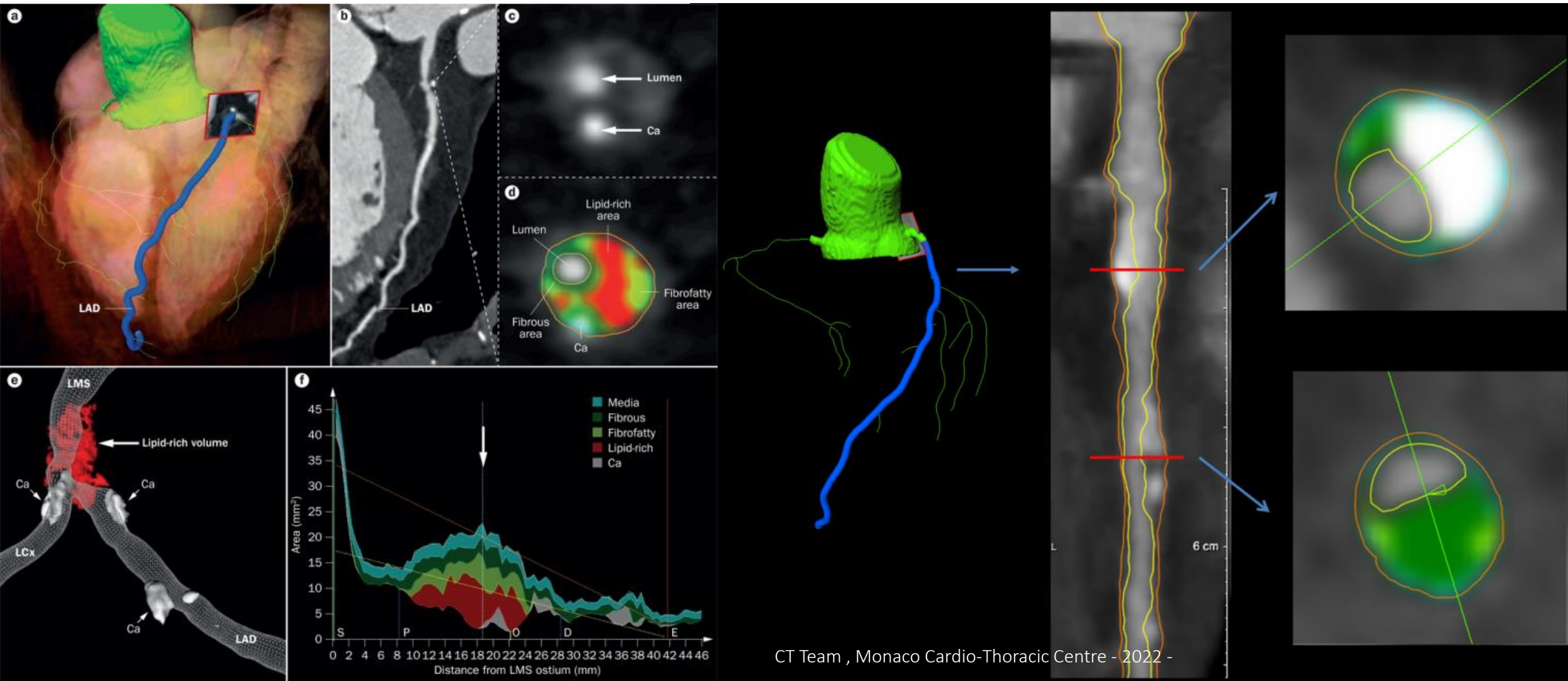
Semi-automatic segmentation of coronary vessel: calcified (yellow), lipid (green) and fibrotic (blue). The cross-section shows a lipid plaque. Adapted from Infante et al. (49) © 2019 by the authors. CC BY 4.0.

...Future step...

To be continued...AI....

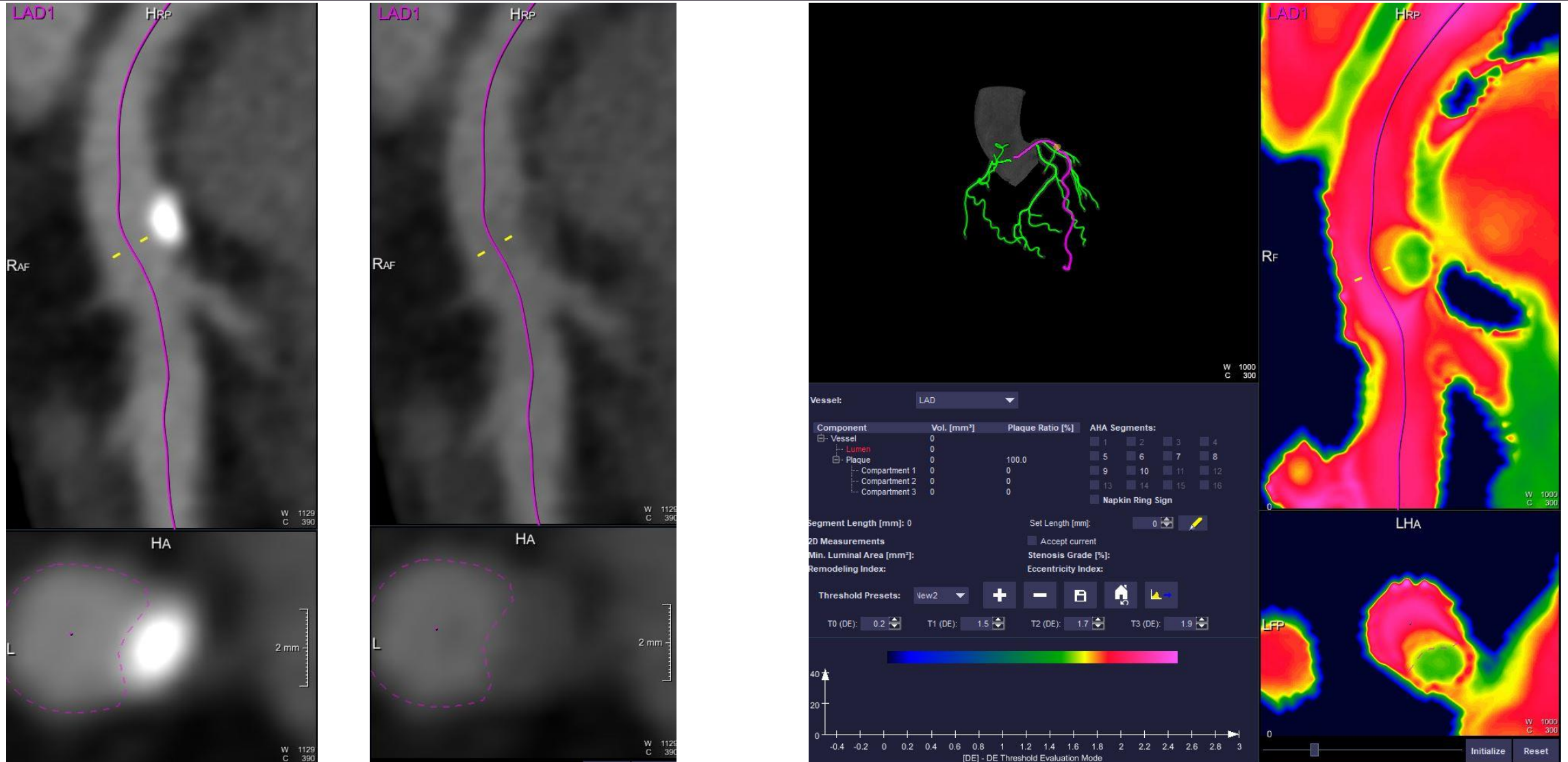
Quantitative plaque nature

with hounsfield unit segmentation



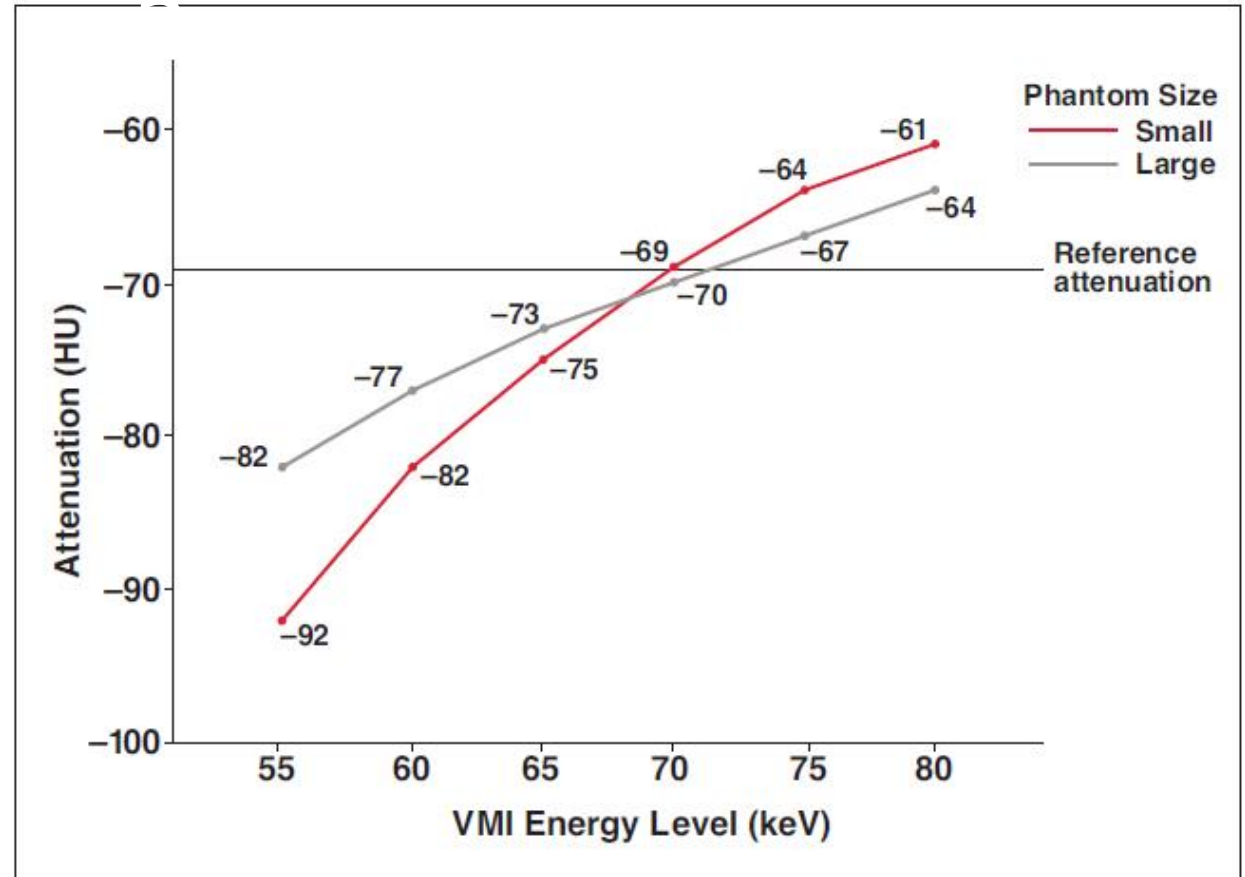
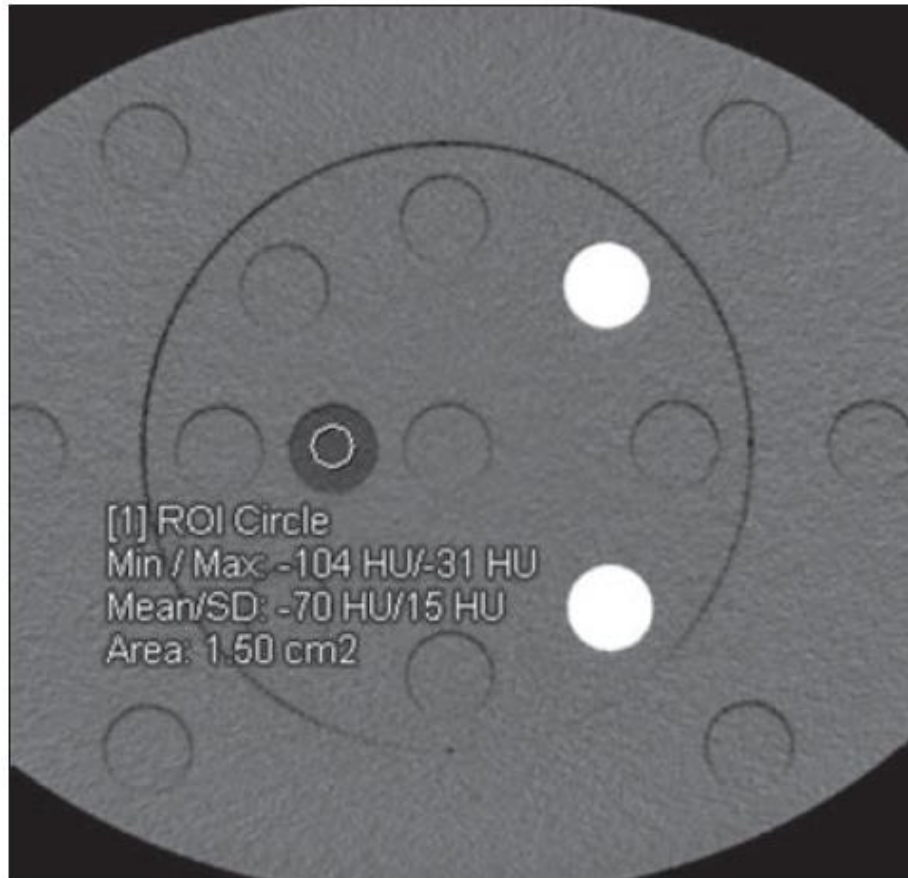
Dual energy ratio heatmap

for analysis of mixed plaques: spectral analysis



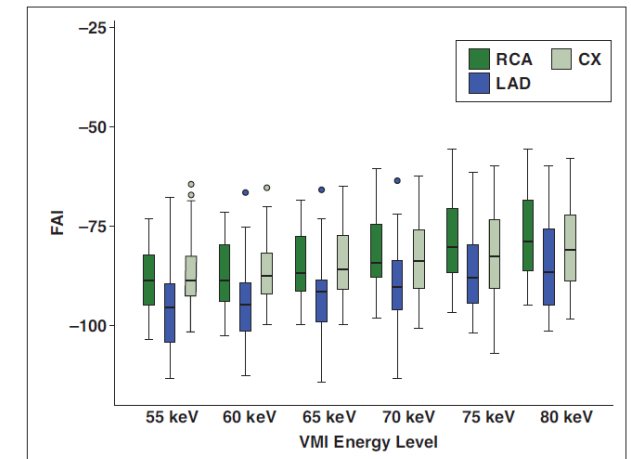
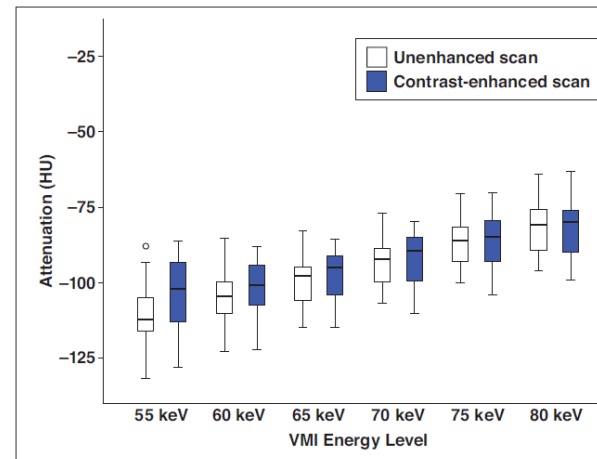
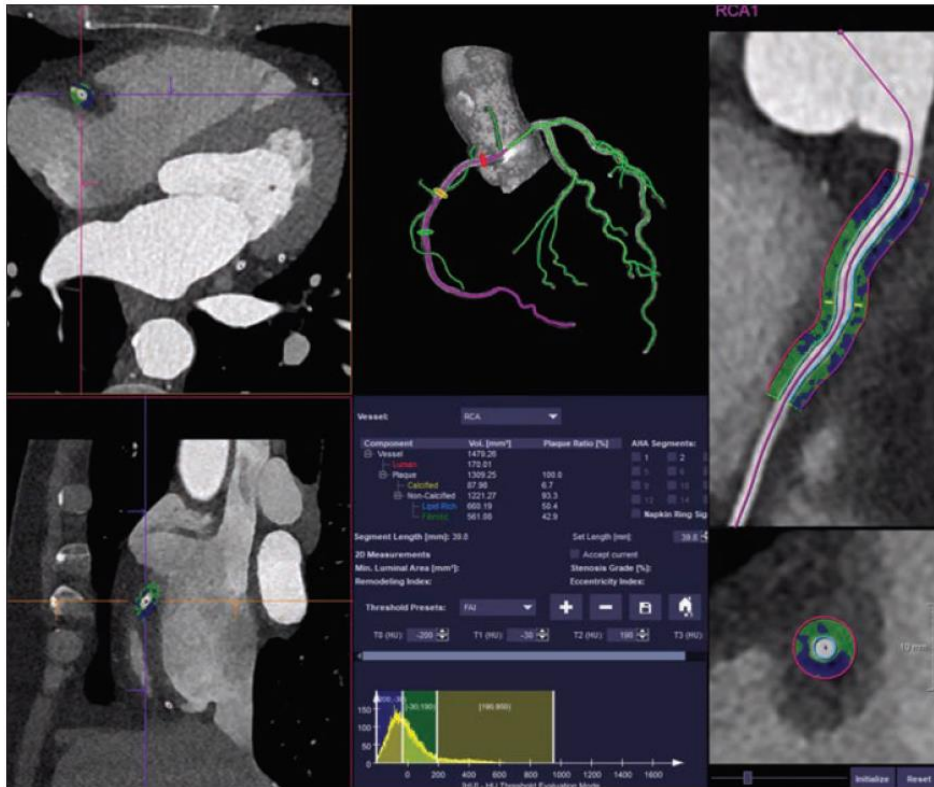
Epicardial adipose tissue attenuation & fat attenuation index

Non invasive marker of vascular inflammation



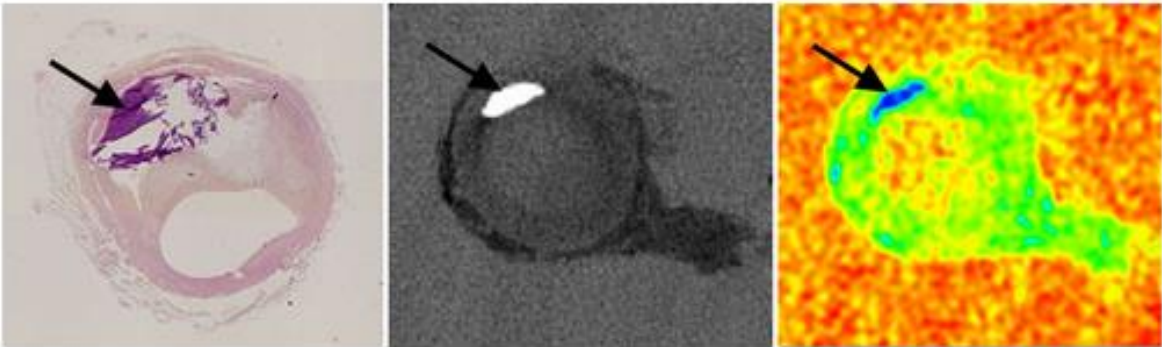
Epicardial adipose tissue attenuation & fat attenuation index

Semi-automated software for FAI computation

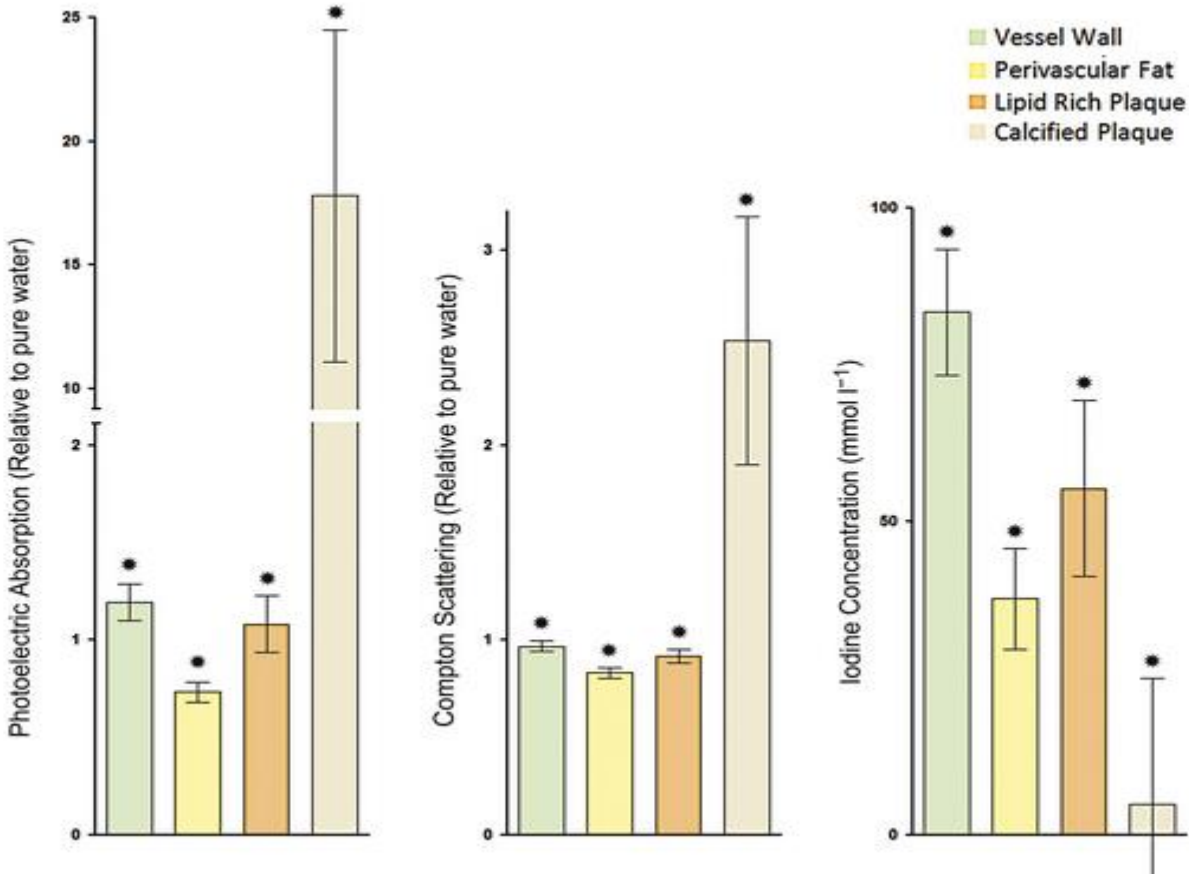
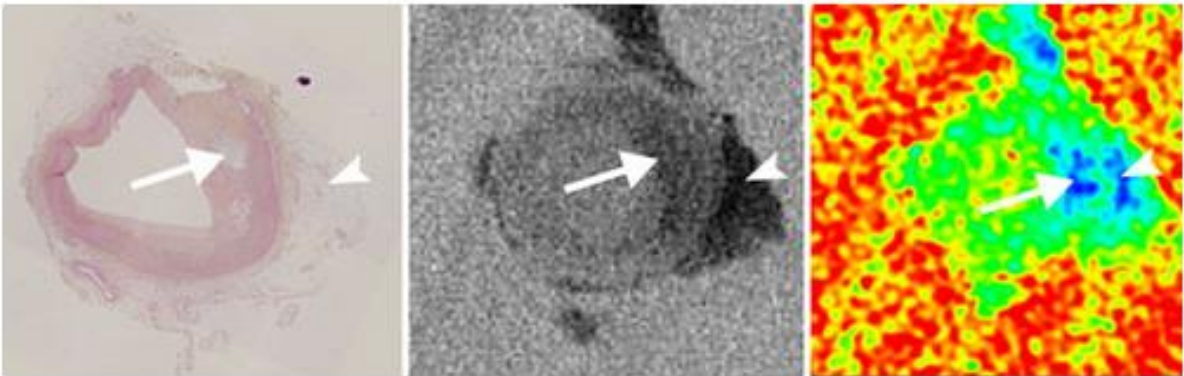


Photon counting spectral CT component analysis of plaques: first post-mortem data

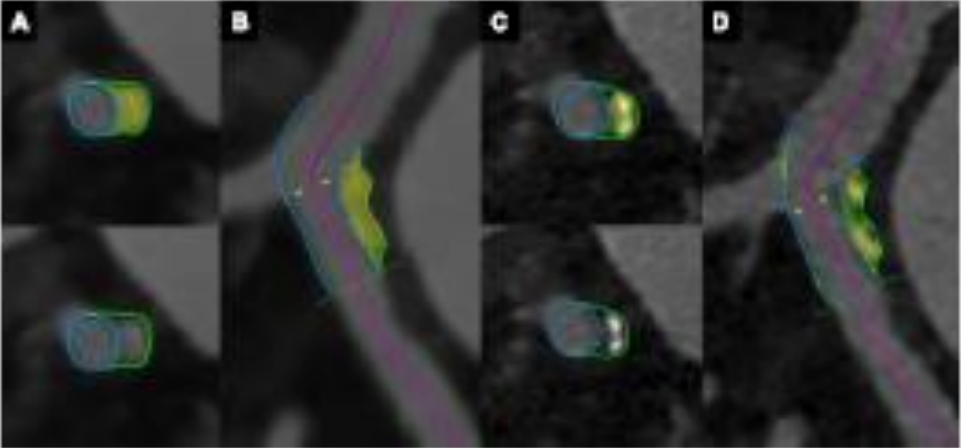
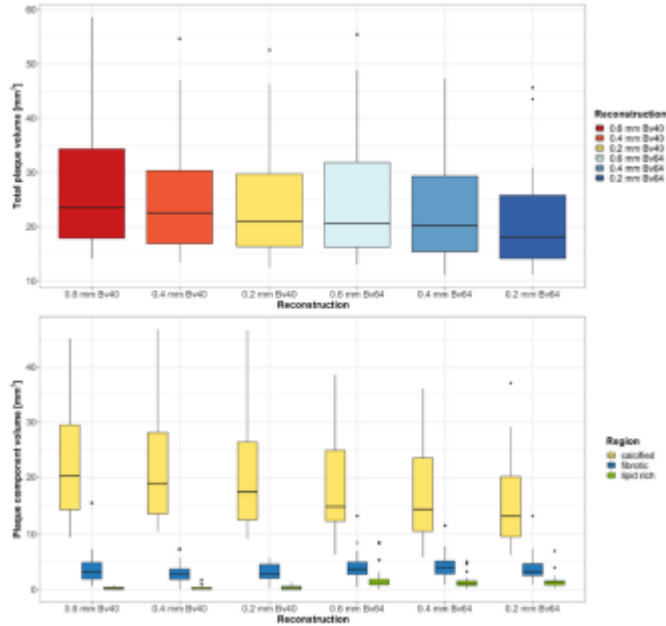
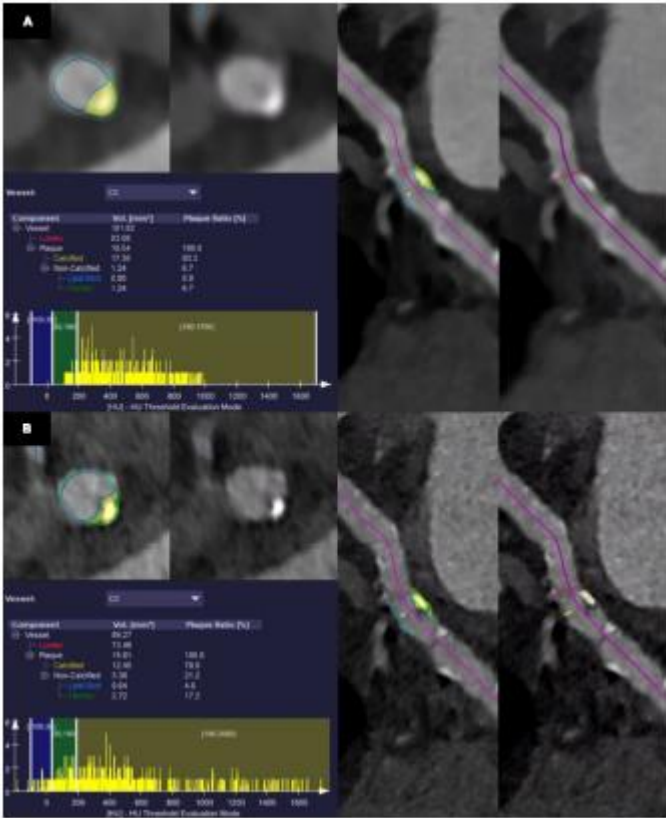
Calcified plaque



Lipid rich plaque

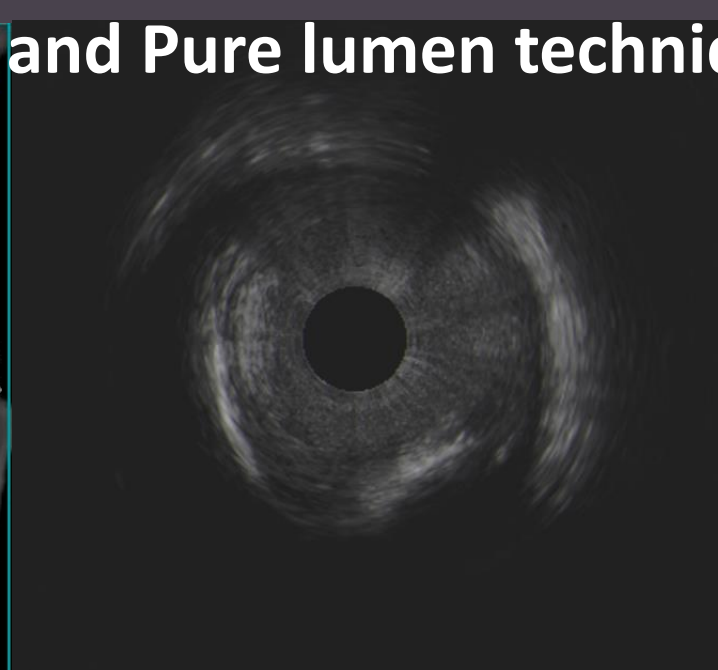


Photon counting spectral CT component analysis of plaques: first post-mortem data



Blue: lipid-rich
 Green: fibrotic
 Yellow: calcified

1st Complex lesion evaluation by CT and Pure lumen technique / Versus IVUS



IVUS Correlation



XA Evaluation

CT-based FFR with Photon Counting

Work In Progress

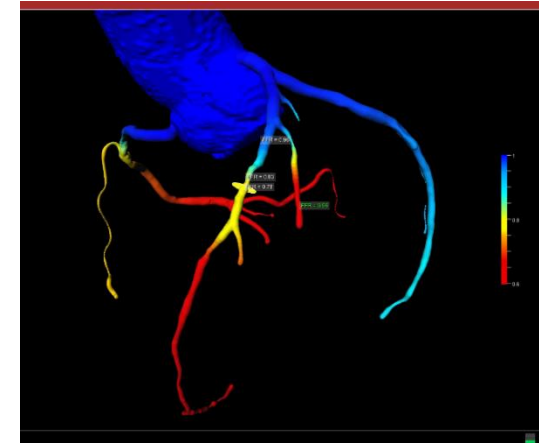
Mono 80 keV



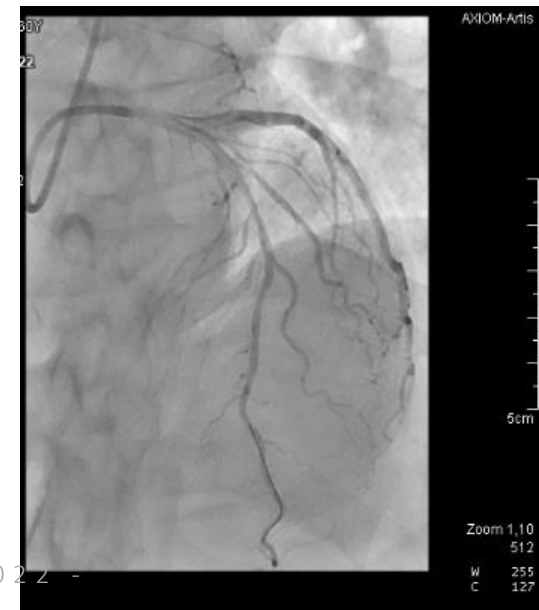
Pure Lumen



CT cFFR results from Mono 80 keV



CT cFFR = 0.78



FFR = 0.79

Imaging Scientific projects @CCM

Spectre study managed by Centre Scientifique de Monaco

Strategy for unstable coronary Plaque in patients presenting to the Emergency department for Chest pain suspected of coronary artery disease. A Trial in primary prevention and cardiovascular Risks Evaluation

Excellent Coronary In-Stent Lumen Visualization with Ultra High Resolution Photon-Counting CT

In collaboration with Zurich university submitted to Journal of Cardiovascular Computed Tomography Oct 2022

Objectives: The aim of this patient study was to evaluate the quality of ultra-high resolution (UHR) coronary computed tomography angiography (cCTA) with a clinical photon-counting detector CT (PCD-CT) system for coronary stent imaging.

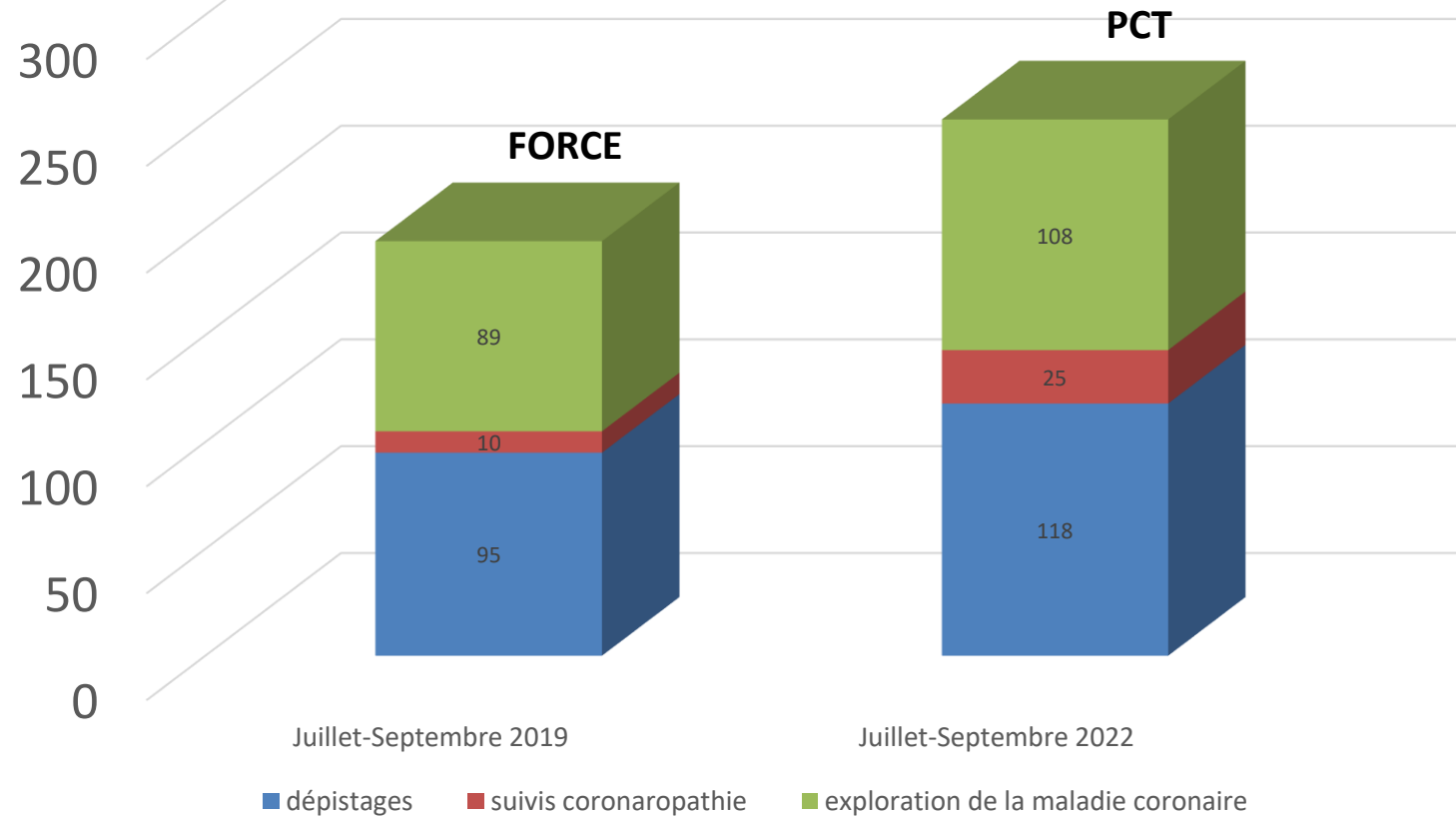
First Analysis comparing Pure lumen results with patients undergoing Coronary Angiogram after Abnormal CT scan We will analyse retrospectively the accuracy of the Pure lumen algorithms to evaluate coronary stenosis degree with calcified plaques

Coronary plaque Analysis with Spectral CT scan compared to intra coronary IVUS

Cardiac MRI Deep learning

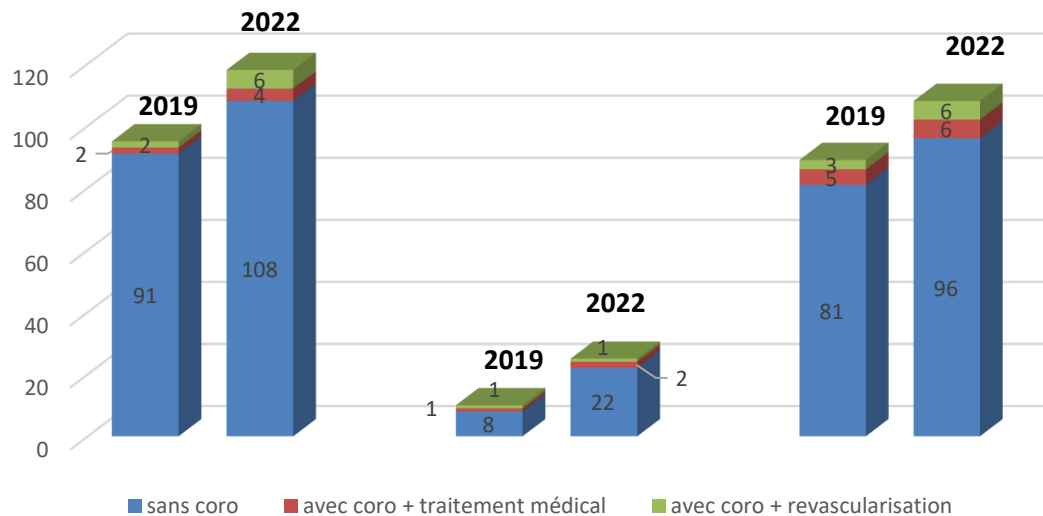
Comparaison de la répartition des scanners coronaires selon les différentes indications

Juillet à Septembre 2019 et 2022



	Juillet-Septembre 2019	Juillet-Septembre 2022
dépistages	95	118
suivis coronaropathie	10	25
exploration de la maladie coronaire	89	108
Total	194	251

Comparaison du nombre de coronarographies générées par le scanner à partir de l'indication initiale et les Modalités de prise en charge thérapeutique

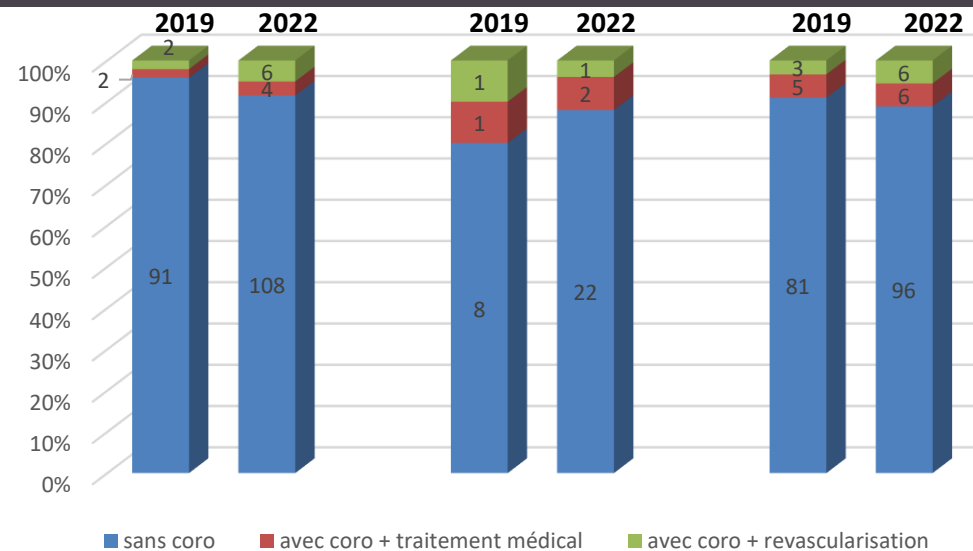


Dépistages

Suivis coronaropathies

Exploration de la maladie coronaire

Comparaison du nombre de coronarographies générées par le scanner à partir de l'indication initiale et les Modalités de prise en charge thérapeutique



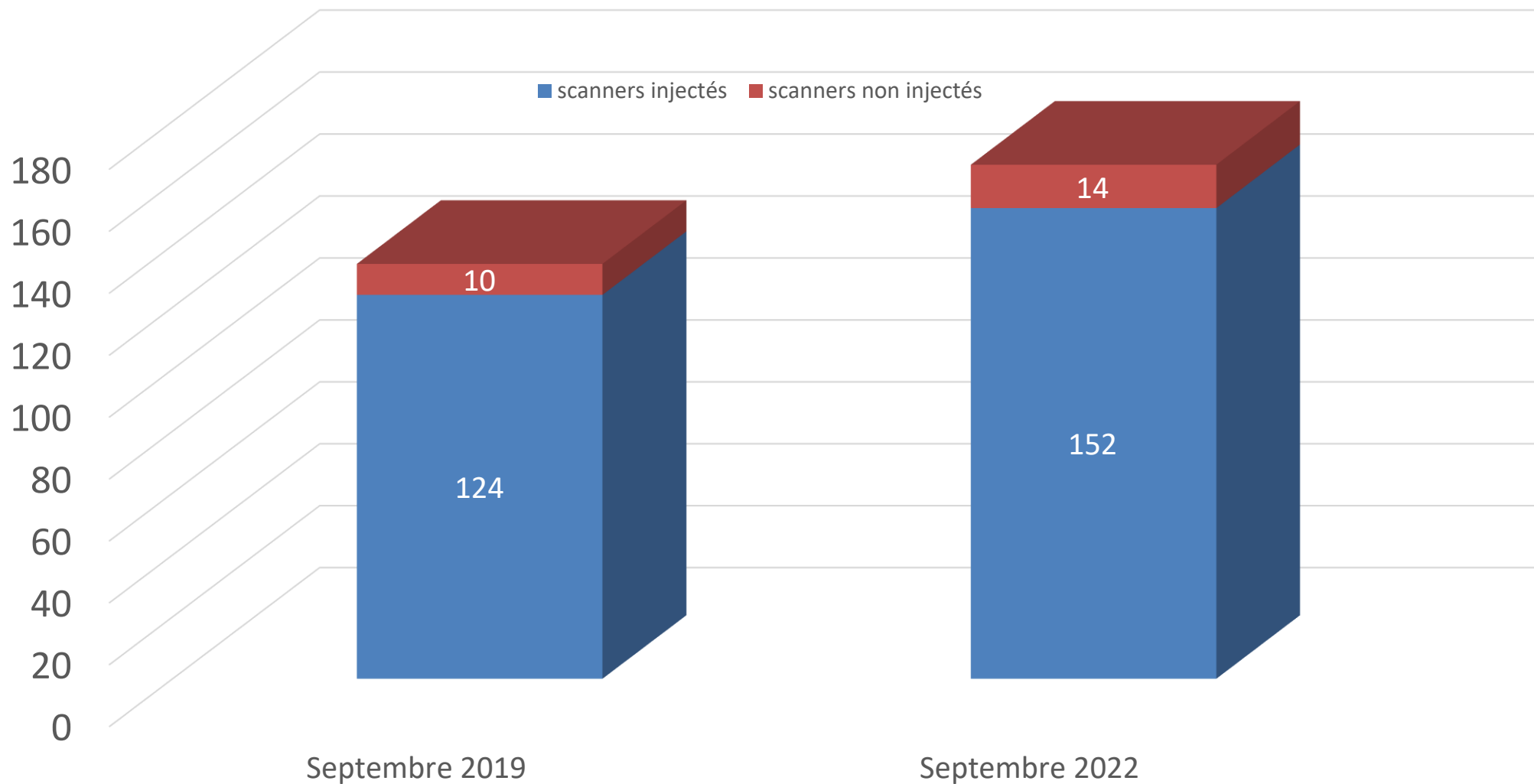
Dépistages

Suivis coronaropathies

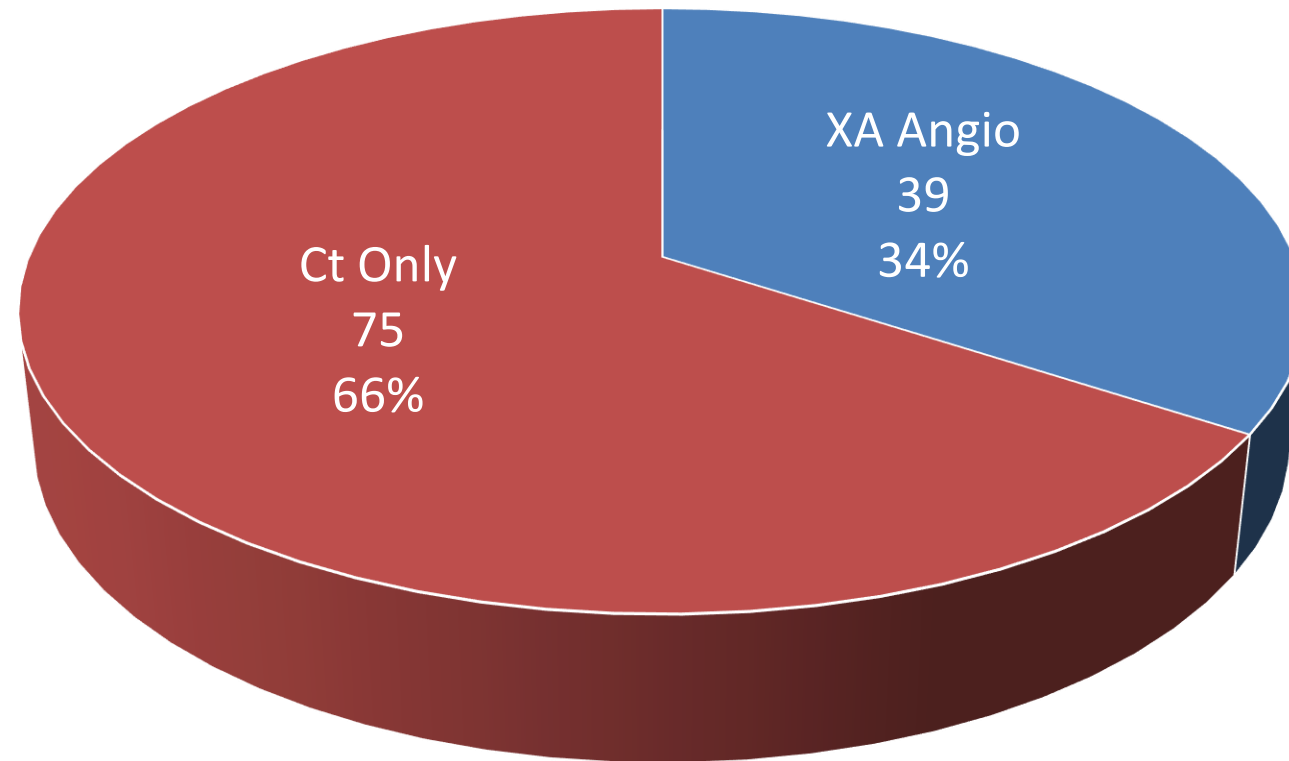
Exploration de la maladie coronaire

	sans coro	avec coro + traitement médical	avec coro + revascularisation	Total
dépistages 2019	91	2	2	95
dépistages 2022	108	4	6	118
suivis coronaropathie 2019	8	1	1	10
suivis coronaropathie 2022	22	2	1	25
exploration de la maladie coronaire 2019	81	5	3	89
exploration de la maladie coronaire 2022	96	6	6	108

Evaluation du nombre de scanners non injectés pour score calcique élevé



114 TAVI 2022



■ XA Angio ■ Ct Only

Les messages clés

- CCTA is the primary imaging modality for the non-invasive anatomical assessment of coronary artery disease
- Excellent visualisation of atherosclerotic plaques and enables the characterization of certain coronary plaque type
- Based on visual assessment
- Blooming artefacts – overestimation of calcified volume
- Difficult delineation of adjacent non calcified components
- *So*

Les messages clés

- PCCT is an exciting advance offering improvement in contrast – to – noise ratio and spatial resolution
- Reduction of calcium blooming artifacts
- Ability to identify plaque components by analysing differences in contrast agent concentration and/or spectral attenuation
- UHR reconstructions (0.2 mm) with sharp kernel (Bv46) differentiate smallest calcified and largest non calcified plaque components
- Risk predictionThe Graal

CT TEAM



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CT Team , Centre Cardio-Thoracique de Monaco - 2021.

Today

- Thin cap fibroatheroma (TCFA)
- Large plaque volume
- Low attenuation (presence of a central focal area within the plaque which has a low attenuation : 1 voxel with < 30 HU)
- Positive remodelling (remodelling index > 1.1)
- Necrotic core
- Napkin-ring sign (central area of low CT attenuation surrounded by ring of higher attenuation)

Napkin ring sign

- TCFA not directly identifiable by CT because actual system spatial resolution is 0.5 mm
- Indirect sign by CT: the napkin ring
- Inhomogeneous plaque containing a core of lower attenuation material and an outer rim with higher attenuation material (less than 130 HU)
- 1st theory: the rim reflects the attenuation difference between the lipid core and outer fibrous plaque
- 2nd theory: vasa vasorum that proliferate in inflammation are responsible for high attenuation of outer rim
- 3rd theory: napkin ring sign depicts central thrombus or hemorrhage with peripheral contrast enhancement



CT Team , Monaco Cardio-Thoracic Centre - 2022 -

Case #1 (DIOM)

Compare VB40 before sp1 to VB50 kernel on MPR

General parameters

Soft version VB40 (before sp1)

- MPR (LAD)
- Bv 40
- 70 Kev

Soft version VB 50

- MPR (LAD)
- Bv 40
- 70 Kev

Soft version VB 50

- MPR (LAD)
- Bv 44
- 70 Kev

Soft version VB 50

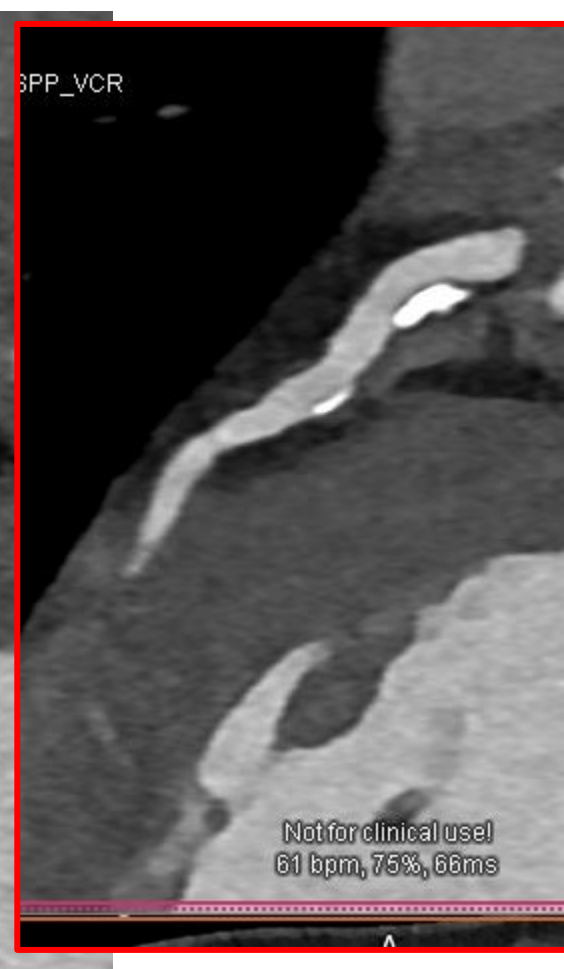
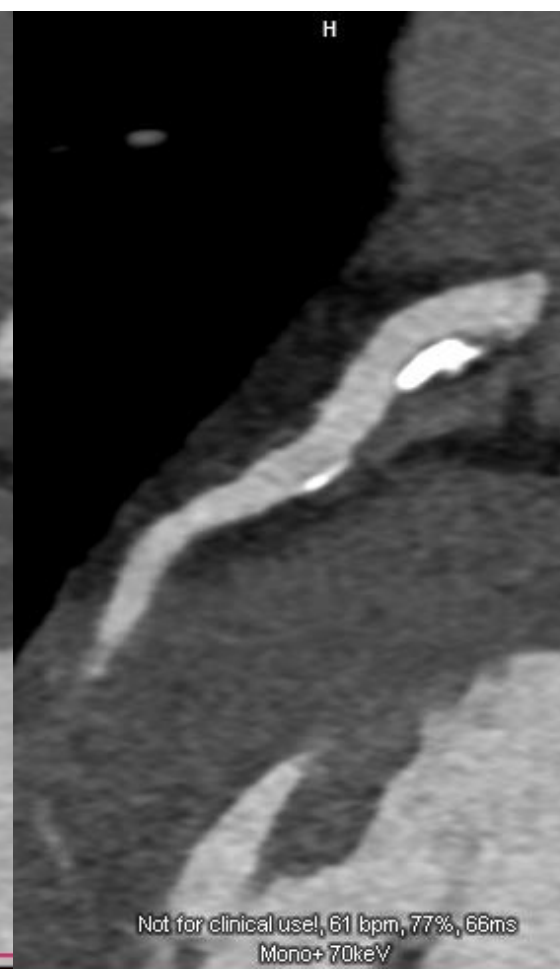
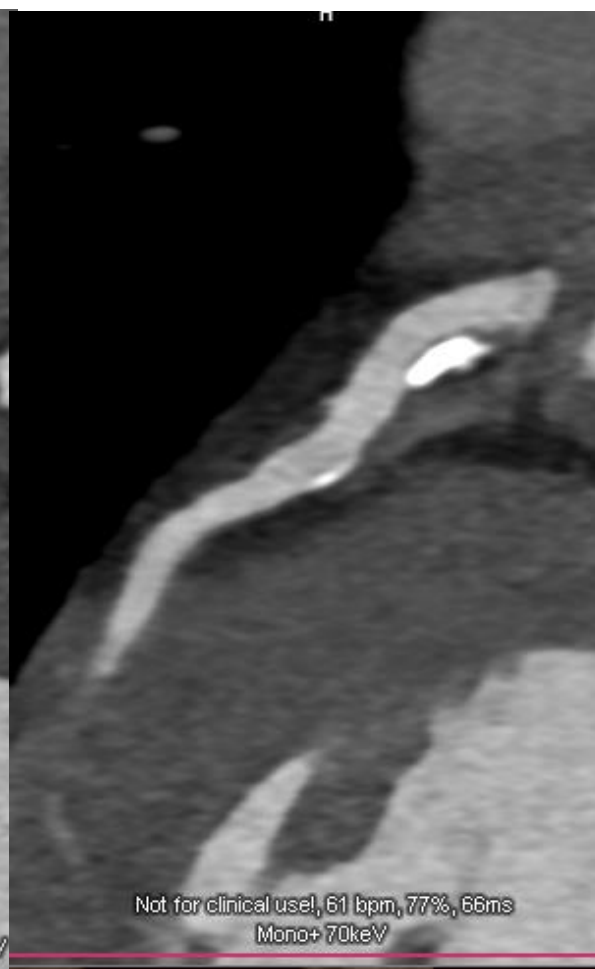
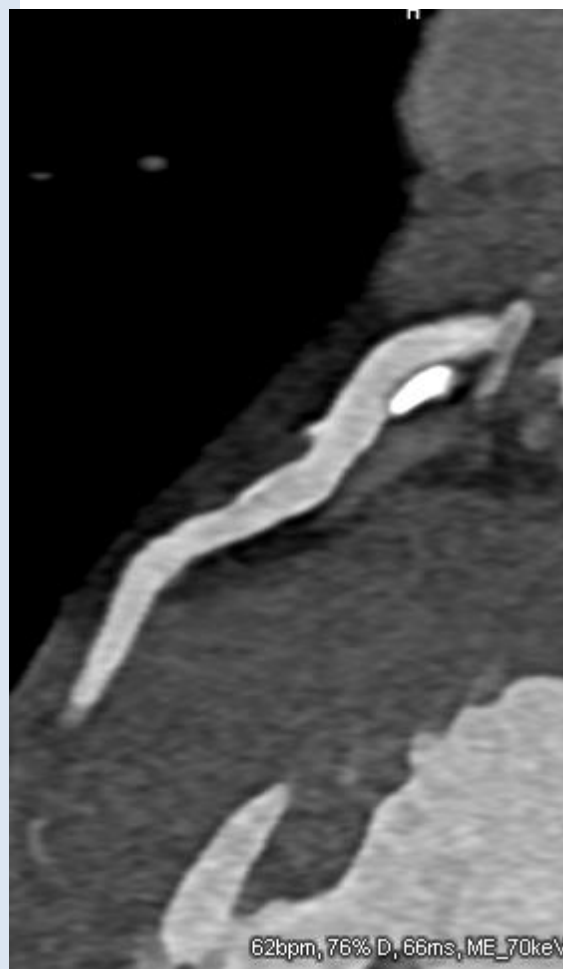
- MPR (LAD)
- Bv 44 v2 it4
- 70 Kev

Aquisition mode:

- 144x0.4

Reconstruction mode:

- Slice thickness: 0.4 mm
- Iterative index: 3



Case #1 (DIO...)

Compare VB40 before sp1 to VB50 kernel

General parameters

Acquisition mode:

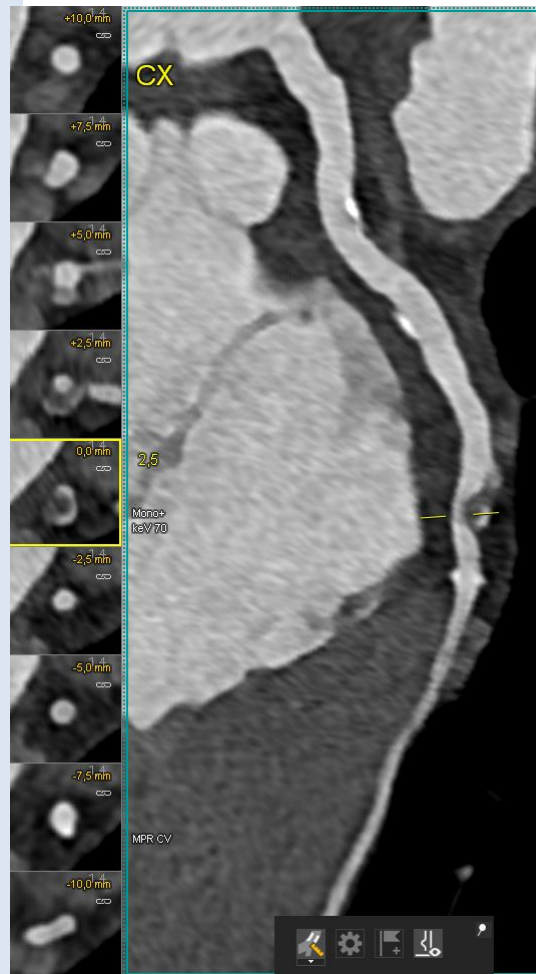
- 144x0.4

Reconstruction mode:

- Slice thickness: 0.4 mm
- Iterative index: 3

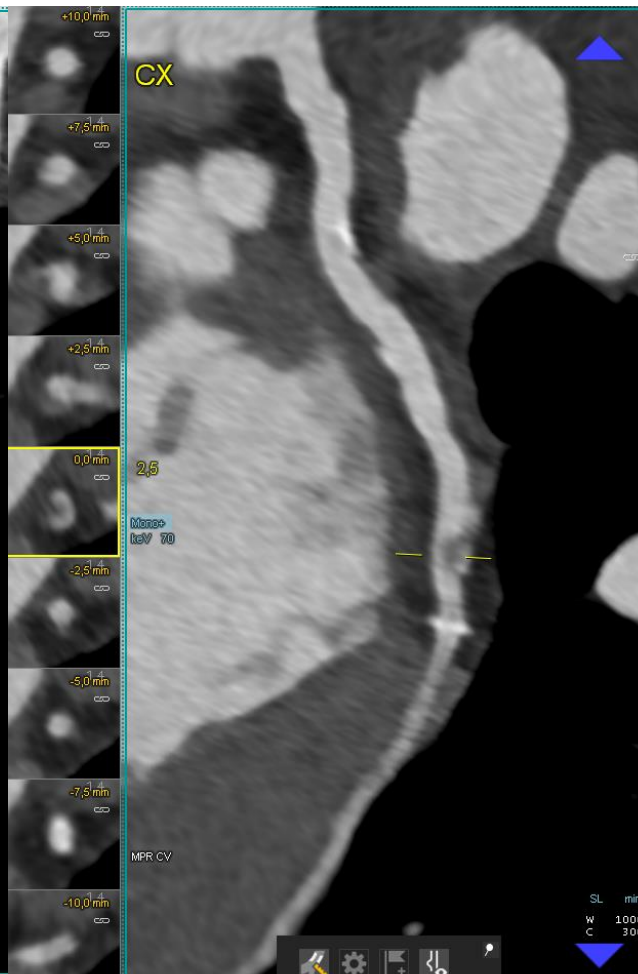
Soft version VB40

- CPR (CX)
- Bv 40
- 70 Kev



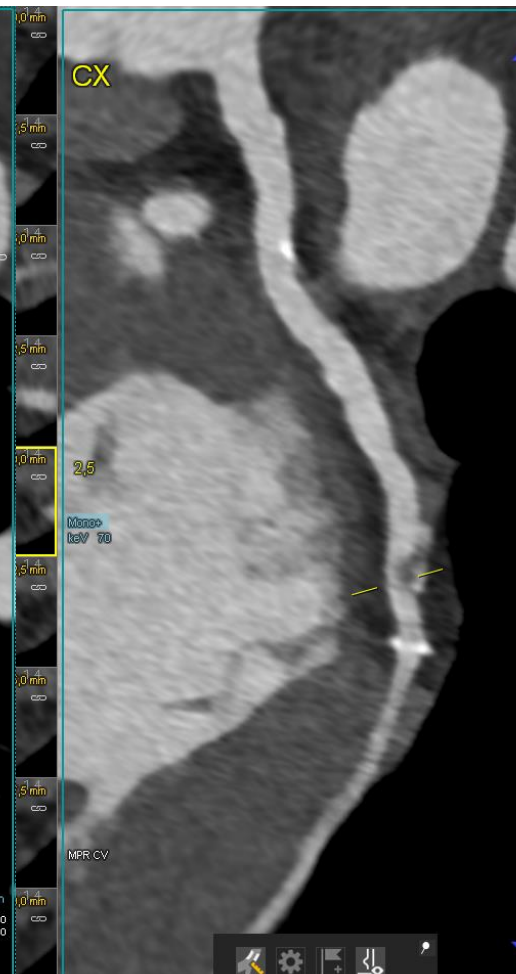
Soft version VB 50

- CPR (CX)
- Bv 36
- 70 Kev



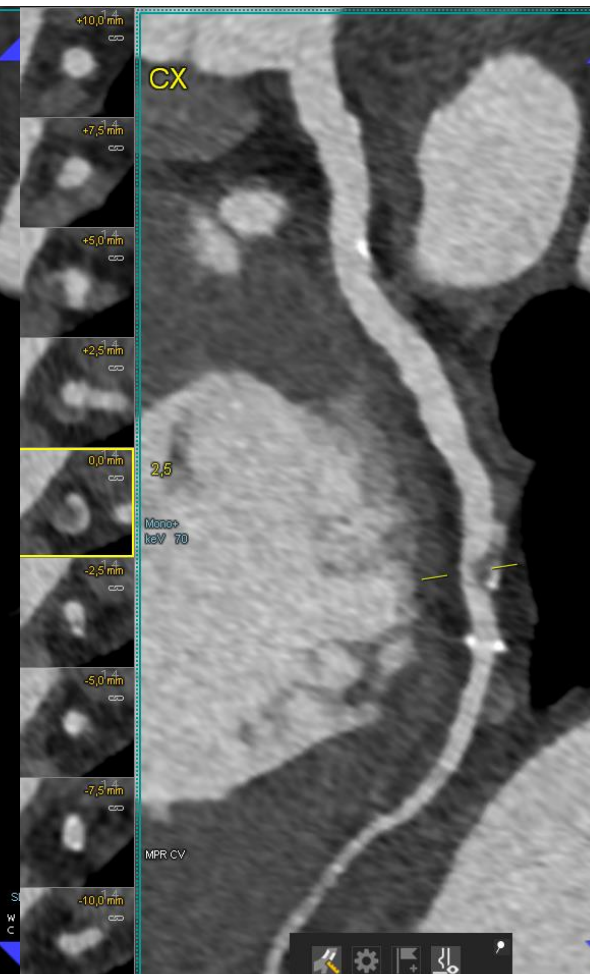
Soft version VB 50

- CPR (CX)
- Bv 40
- 70 Kev



Soft version VB 50

- CPR (CX)
- Bv 44
- 70 Kev



Case #1 (DIO...)

Compare VB40 before sp1 to VB50 kernel

General parameters

Acquisition mode:

- 144x0.4

Reconstruction mode:

- Slice thickness: 0.4 mm
- Iterative index: 3

Soft version VB40

- CPR (CX)
- Bv 40
- 70 Kev

Soft version VB 50

- CPR (CX)
- Bv 40
- 70 Kev

Soft version VB 50

- CPR (CX)
- Bv 44
- 70 Kev

Soft version VB 50

- CPR (CX)
- Bv 44 v2 IT4
- 70 Kev

