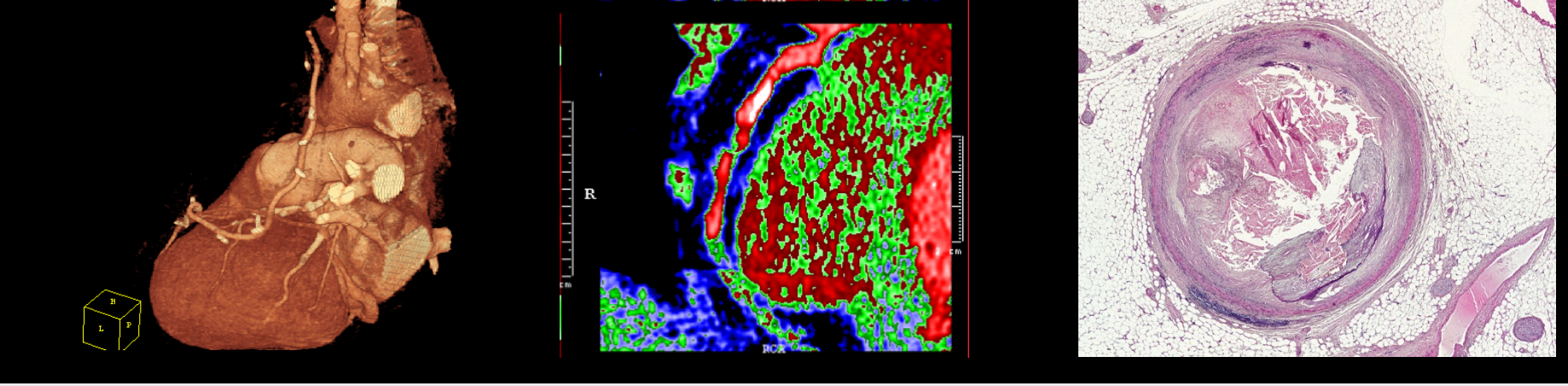

Rôle du CT dans la pathologie cardiaque et coronarienne

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Av.Hippocrate, 10
1200 Bruxelles

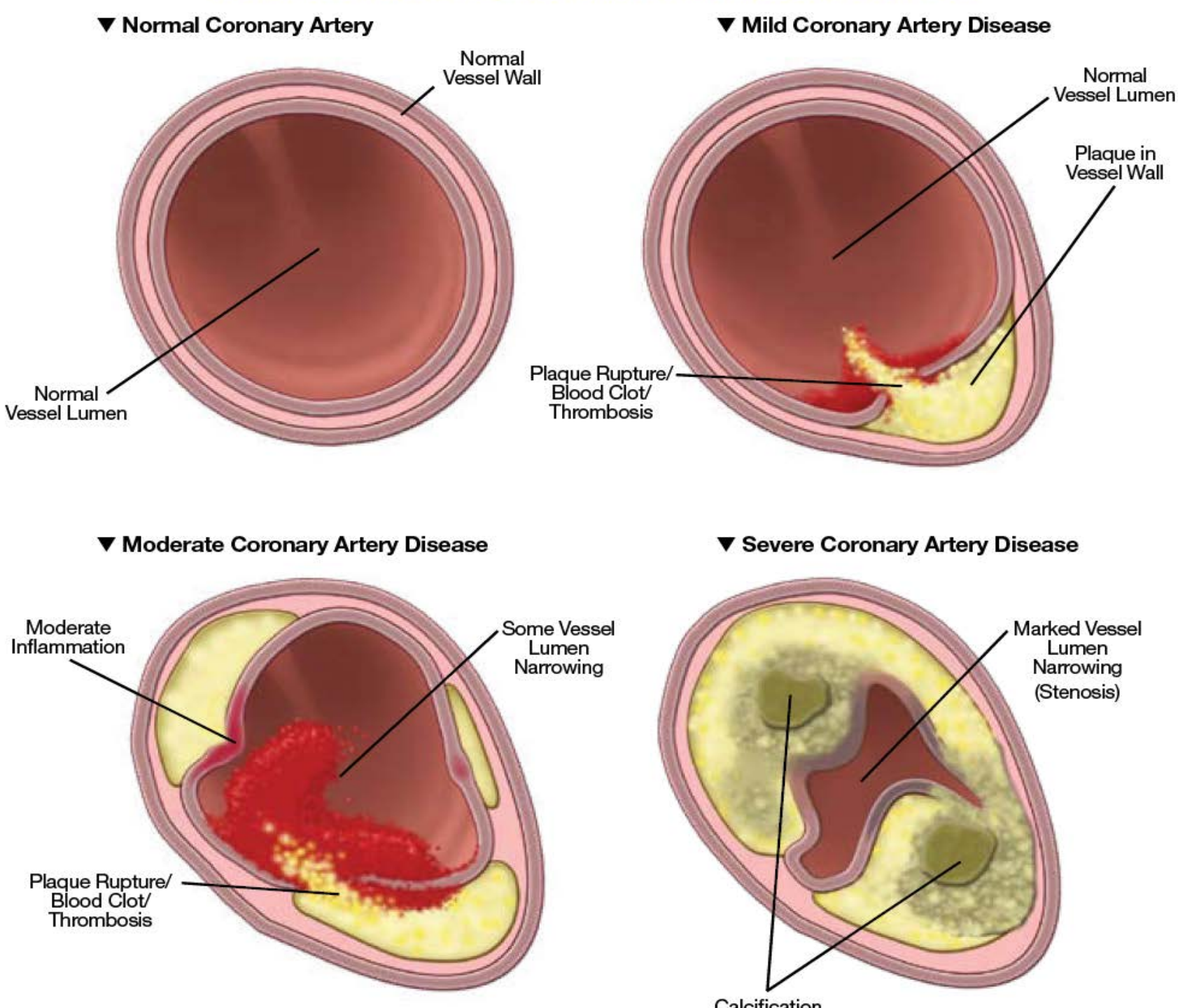
Cours Master 1

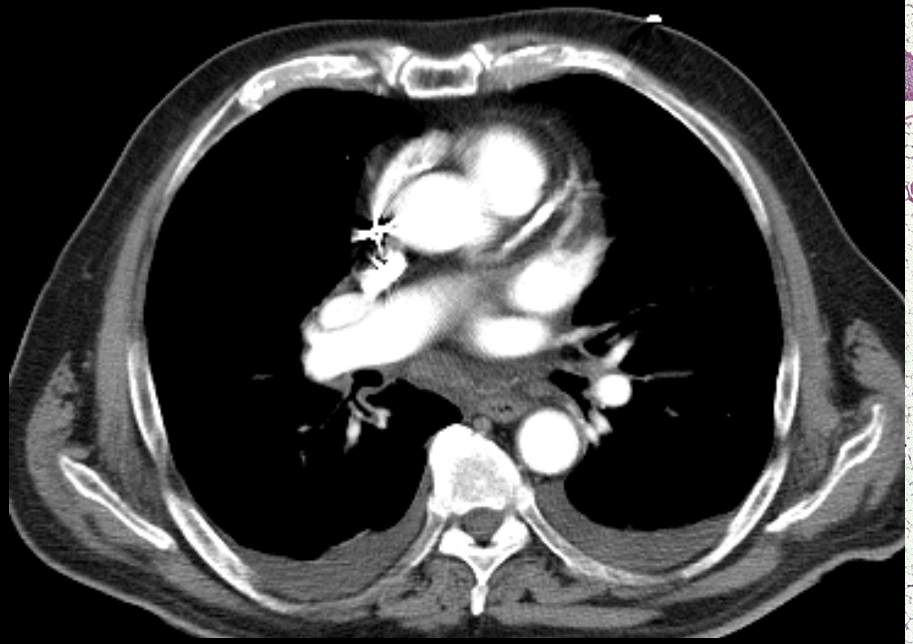
WMDS 2127

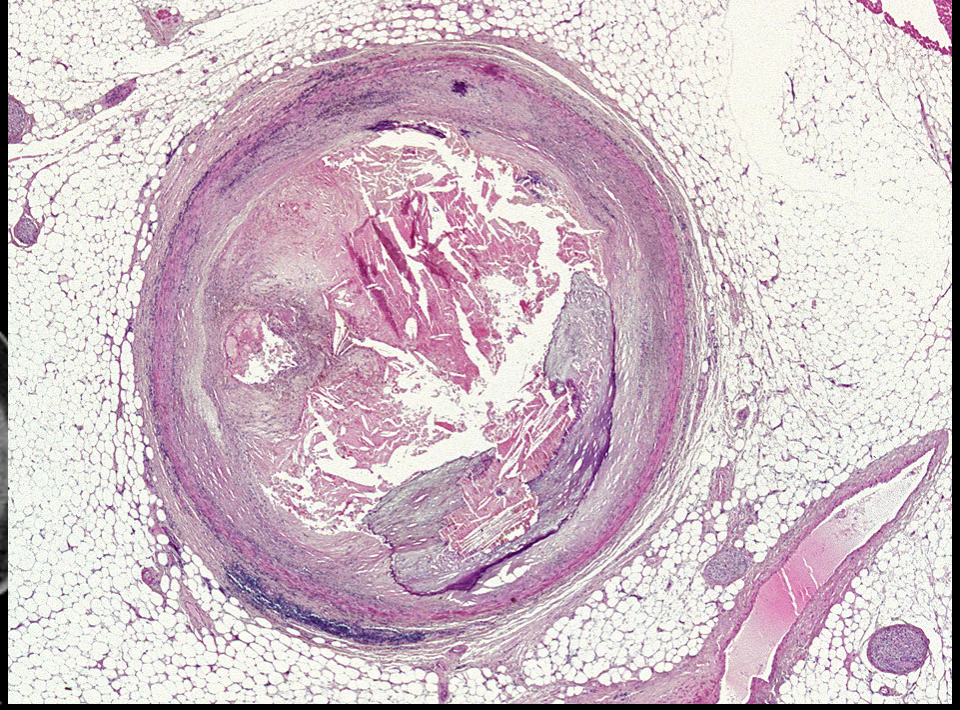
07/10/2021

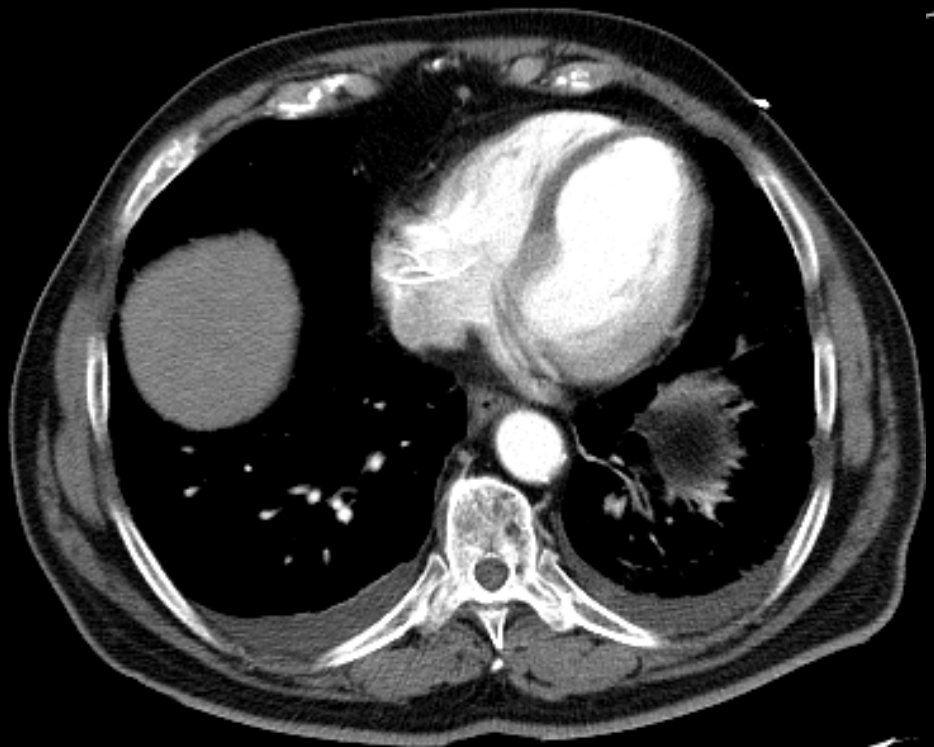
Maladie coronarienne

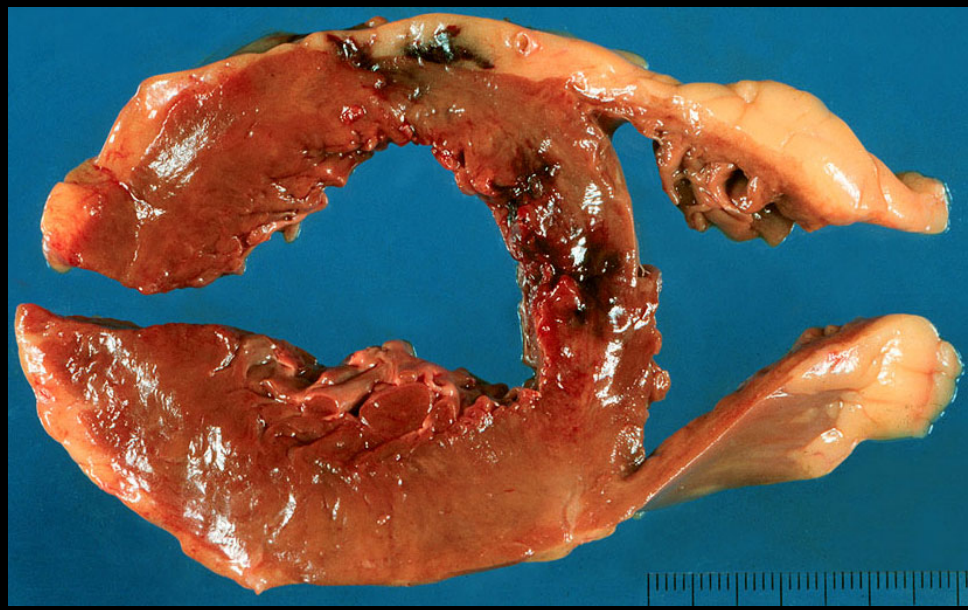
- Cause principale de mortalité dans les pays occidentalisés
  - >10^6 événements cardiaques aigus aux USA
  - > 500 10^3 †
  - 12 10^6 histoire de maladie coronarienne symptomatique
  - 115 milliards de $
- Diagnostic par coronarographie
  - Invasive, hématome au pt de pct, emboles..
  - 1/3 seulement s'accompagnent de traitement percutané


▼ Normal Coronary Artery
Normal Vessel Wall
Normal Vessel Lumen
▼ Mild Coronary Artery Disease
Normal Vessel Lumen
Plaque in Vessel Wall
Plaque Rupture/ Blood Clot/ Thrombosis
▼ Moderate Coronary Artery Disease
Moderate Inflammation
Some Vessel Lumen Narrowing
Plaque Rupture/ Blood Clot/ Thrombosis
▼ Severe Coronary Artery Disease
Marked Vessel Lumen Narrowing (Stenosis)
Calcification

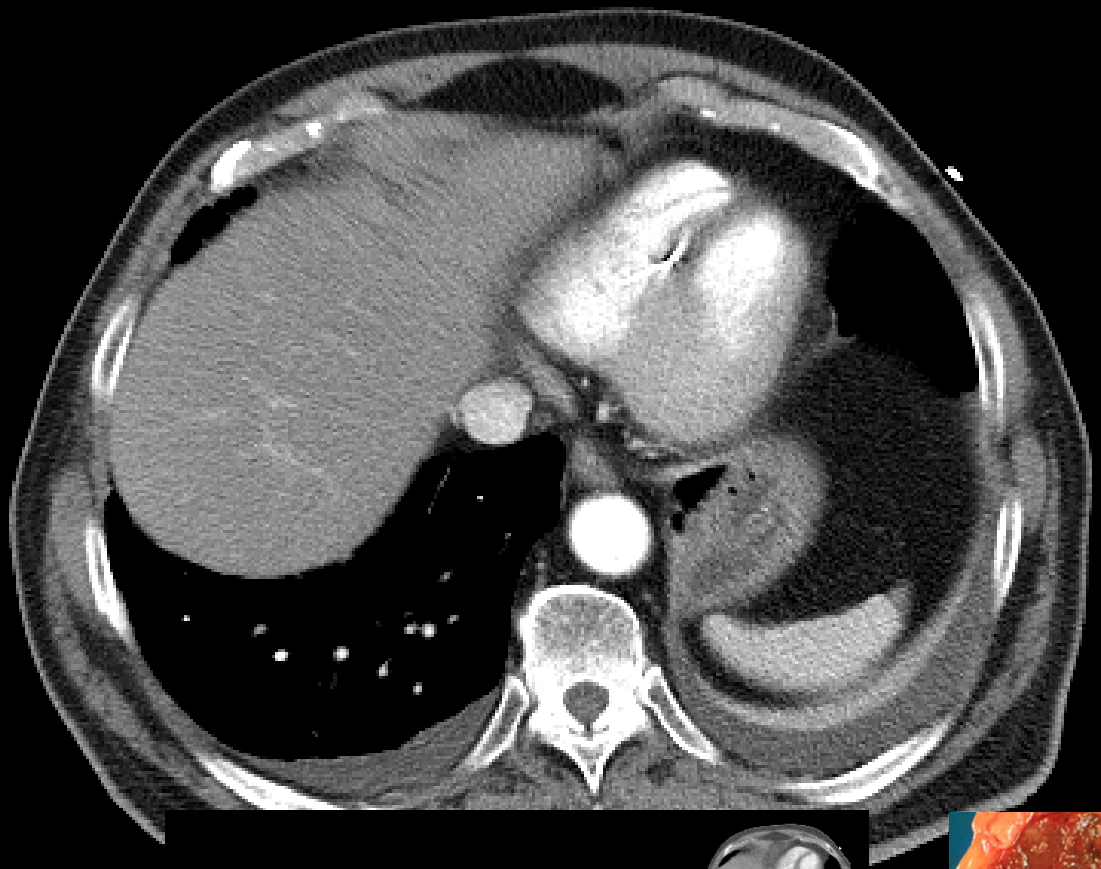


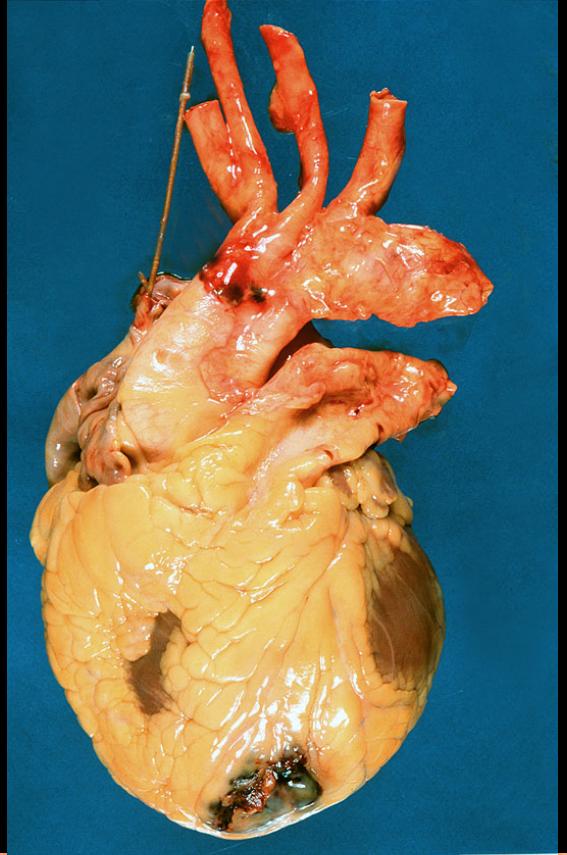


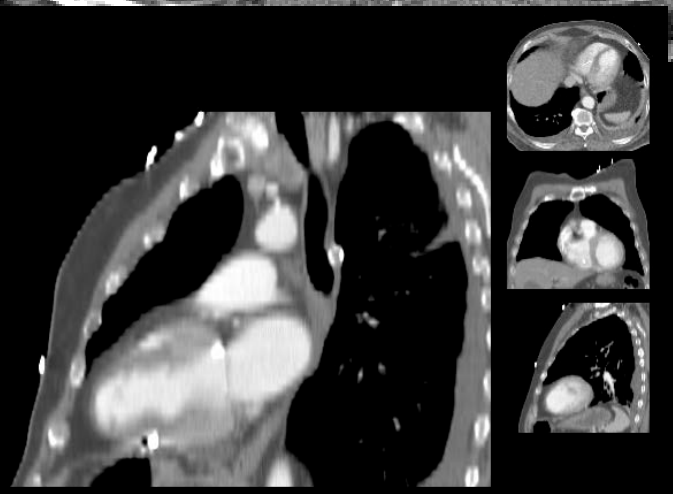


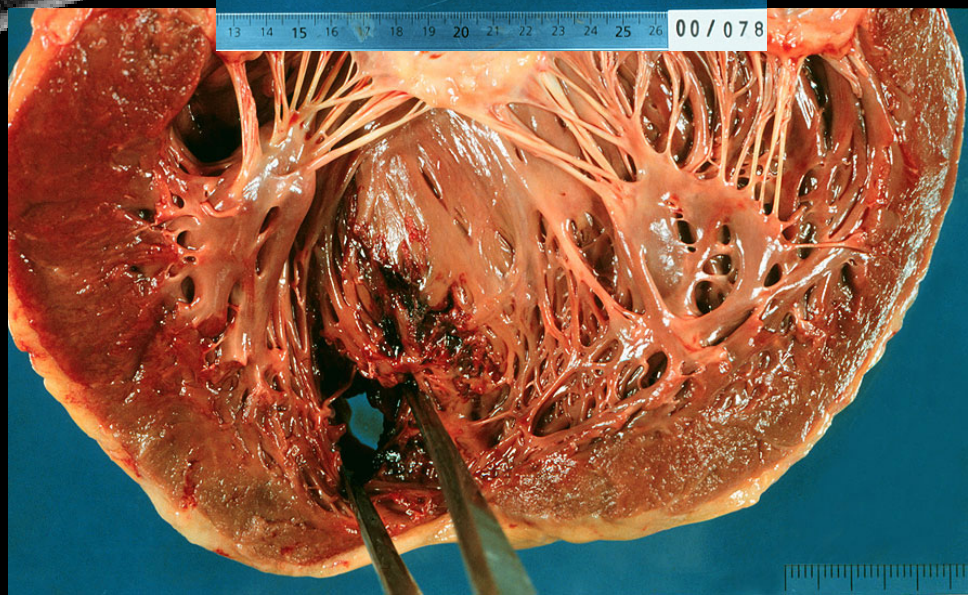


Coche et al. European Heart J. 2006; 27: 20








00/078

CT multidétecteur

4-256 coupes/rotation

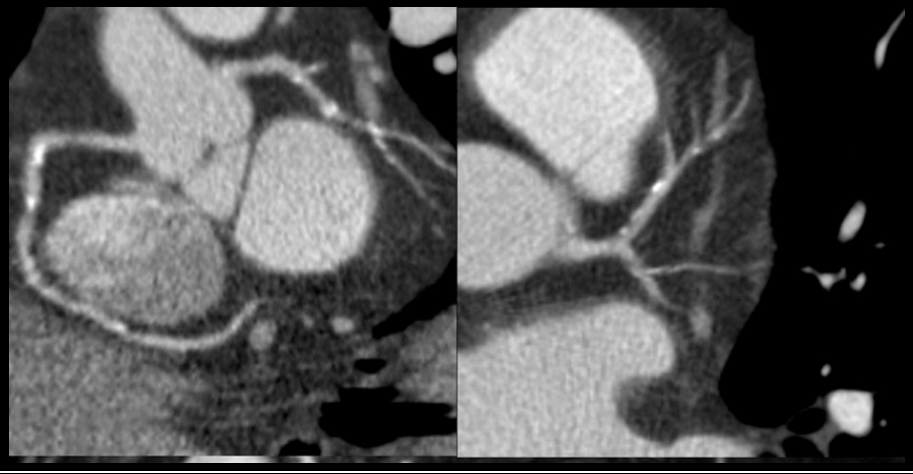
Toshiba: 320 coupes/rotation

16 cm de couverture

Imagerie cardiaque en 1 battement

CT double source

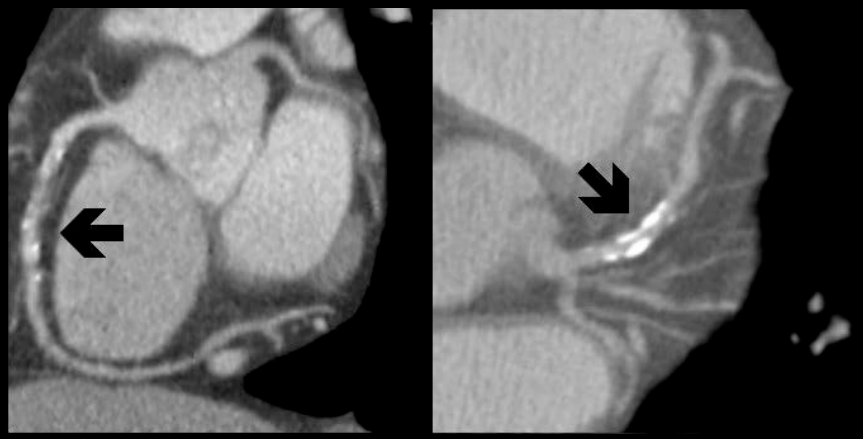
CT spectral monosource



4 coupes/rotation

2000: 4 x1 mm

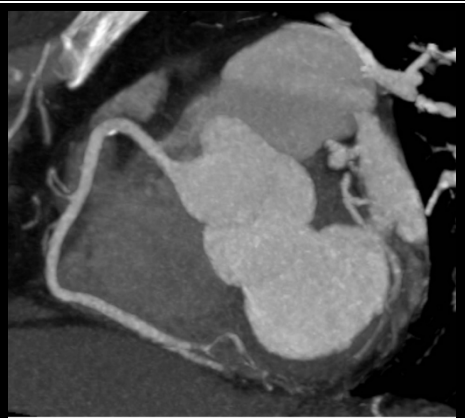
Temps d’acquisition: 45 sec



16 coupes/rotation

2004: 16 x 0.75 mm

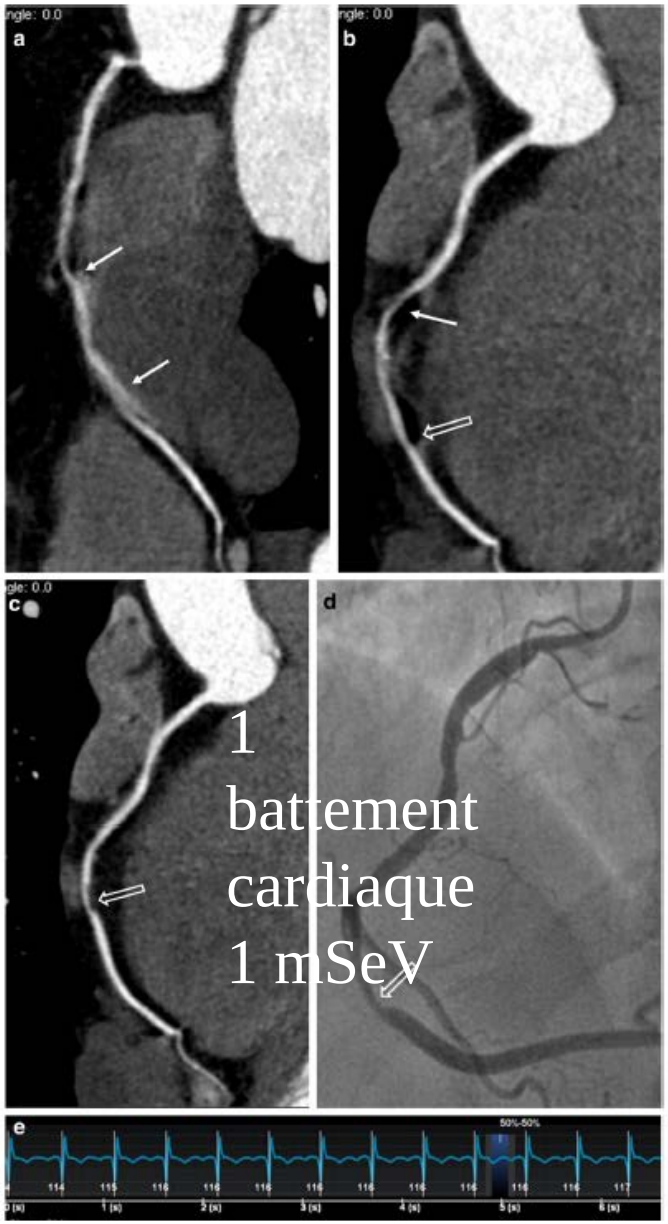
Temps d’acquisition: 25 sec



40-64 coupes/rotation-CT dual

2005: 40-64 x 0.625 mm

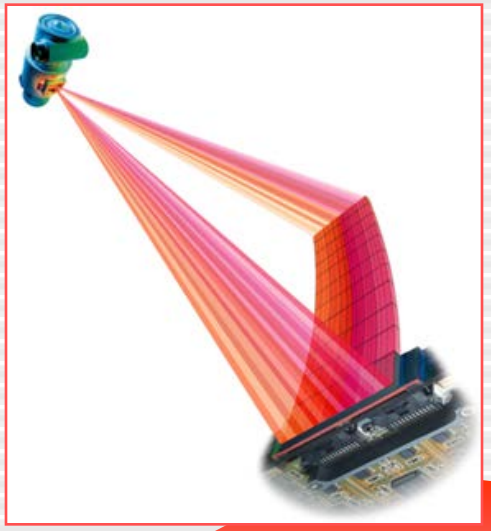
Temps d’acquisition: 10 sec



Liang J etal. European Radiology **volume 29**, pages 4215–4227 (2019

Eighty-one consecutive symptomatic cardiac patients with increased heart rates (≥ 75 beats per min) were enrolled. All patients underwent CCTA and invasive coronary angiography (ICA). CCTA was performed with a 256-detector row CT using prospectively ECG-triggered single-beat protocol.

Brilliance CT Asymetrix detector



256-row Multi-Detector

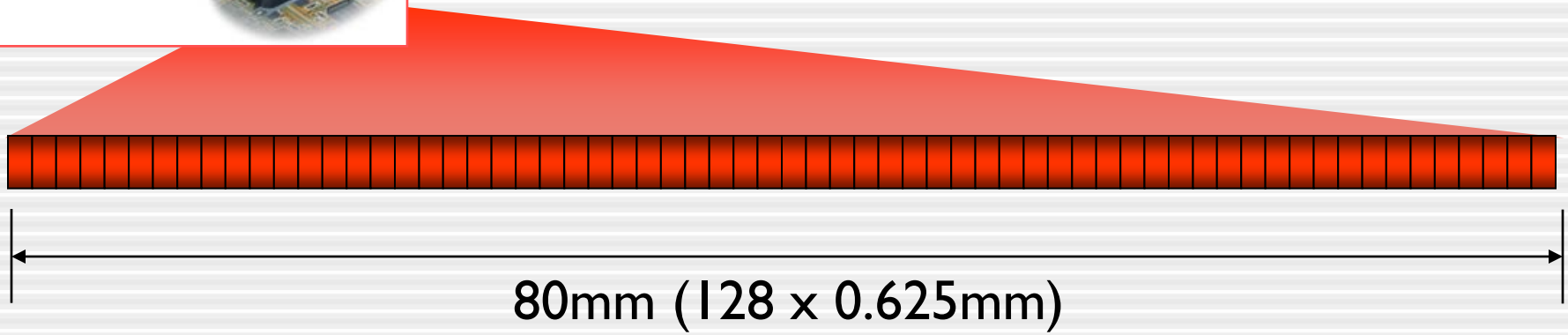
Collimation = area of detector covered

‘ConeBeam acquisition’

128-channel DAS

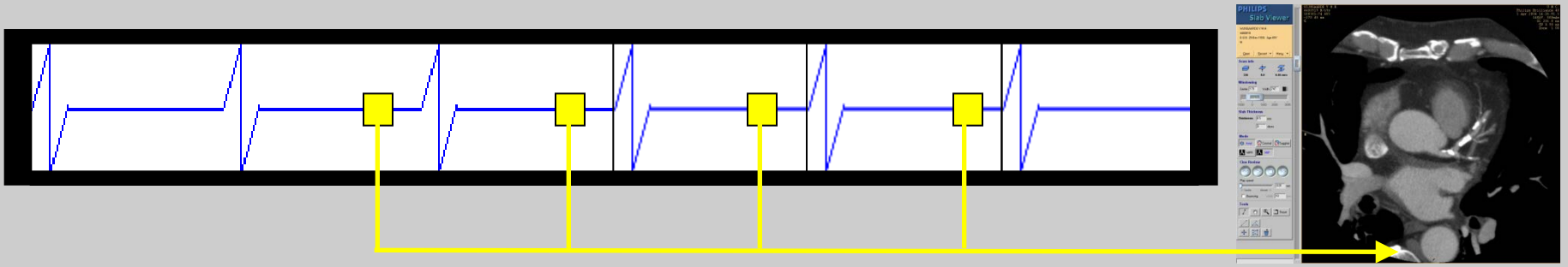
80mm Hi-resolution coverage

0.34mm in Z-axis

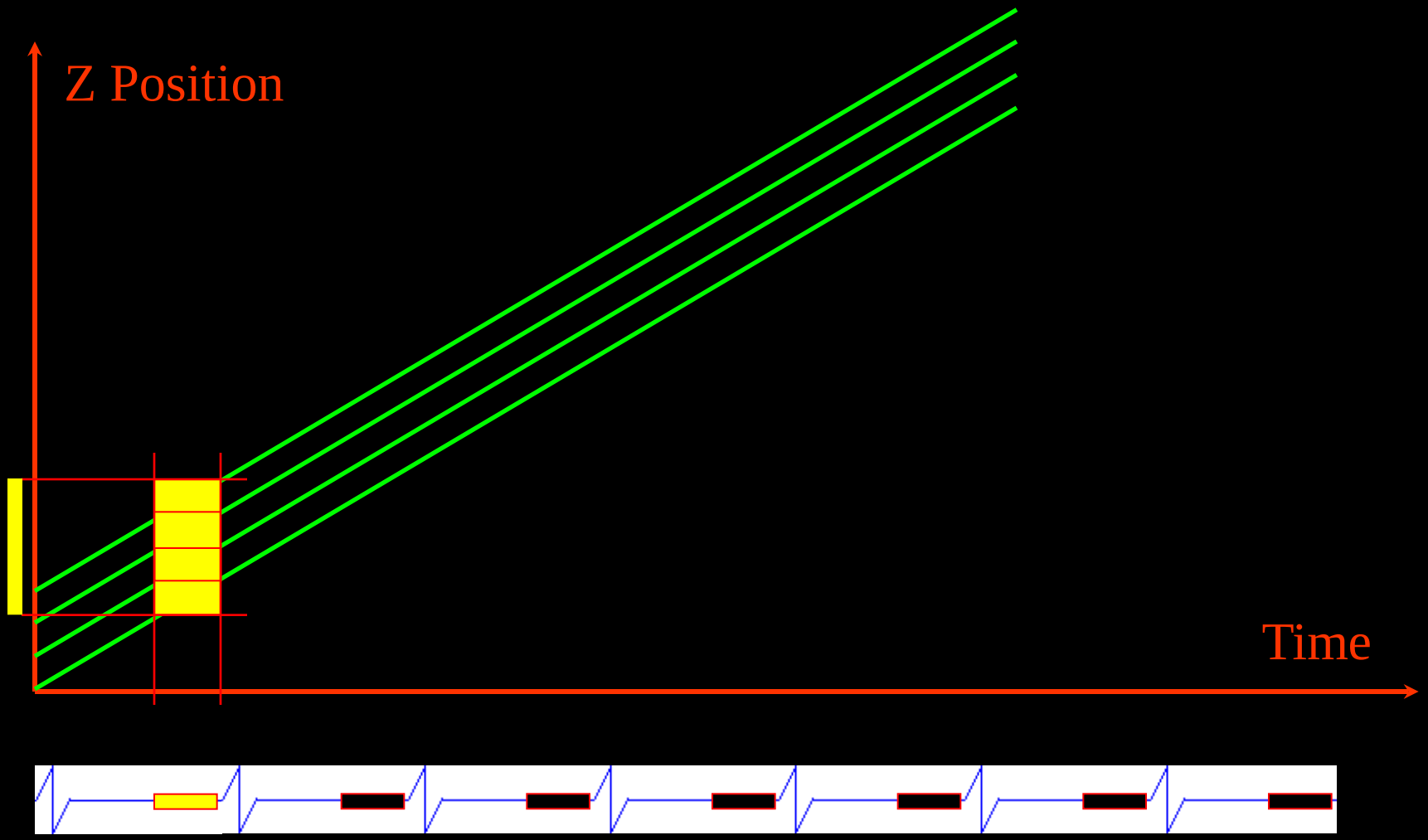


Acquisition de l’examen

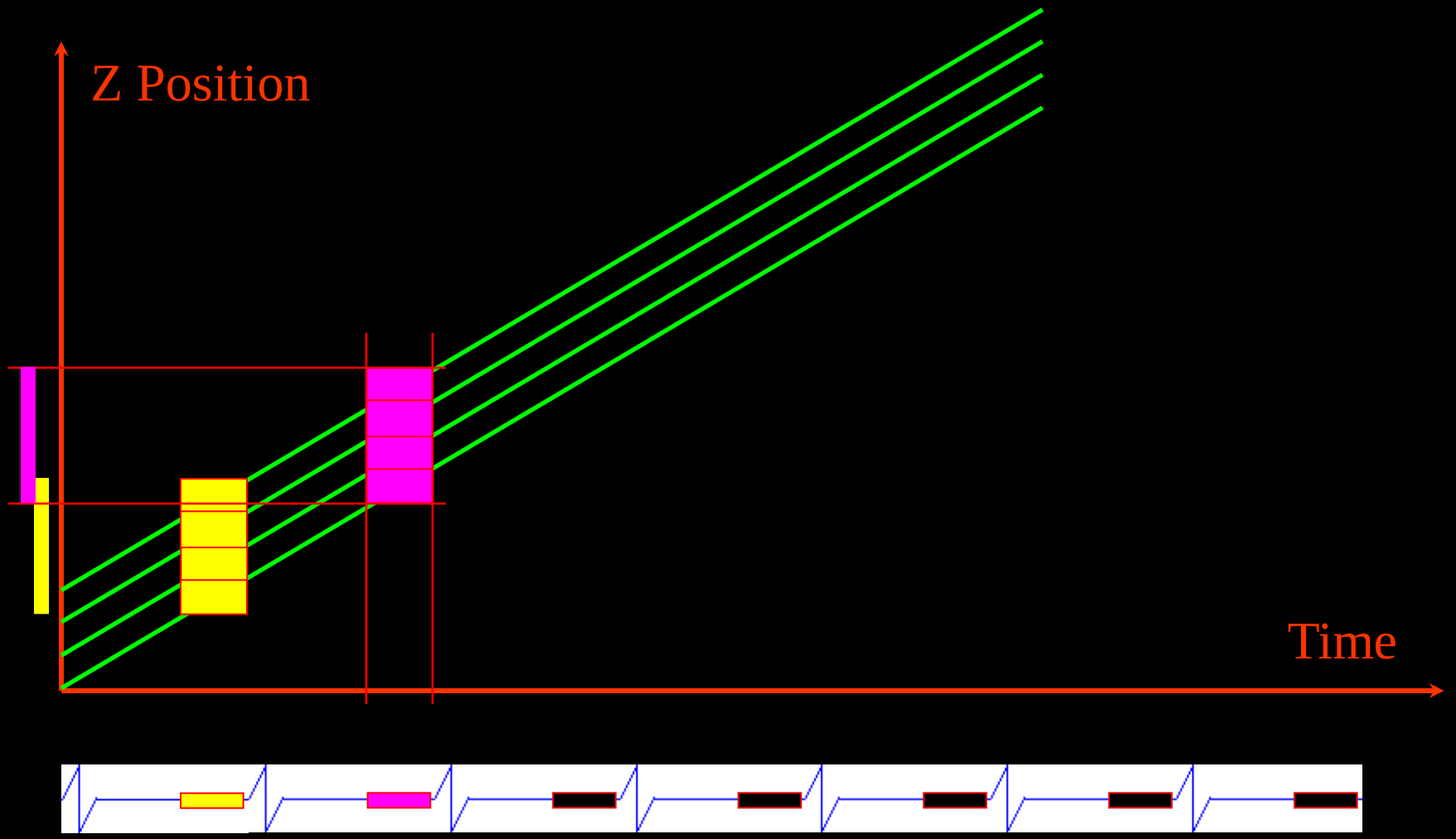
- 40-256 x 0.625 mm :collimation la plus fine
- Synchronisation cardiaque rétrospective
- Vitesse rotation la plus élevée
- 120 kV, 600-800 mAs



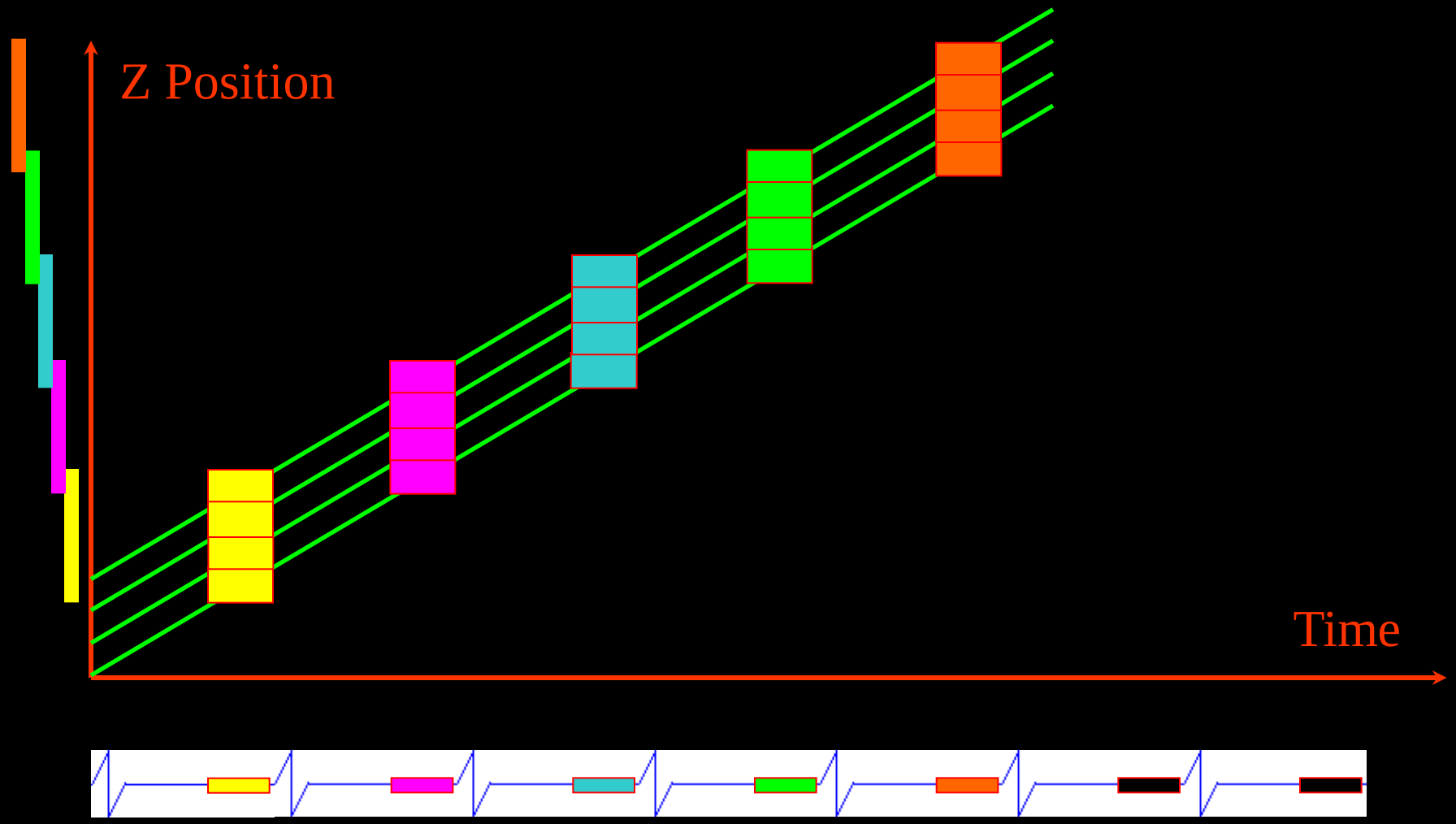
Synchronisation cardiaque rétrospective



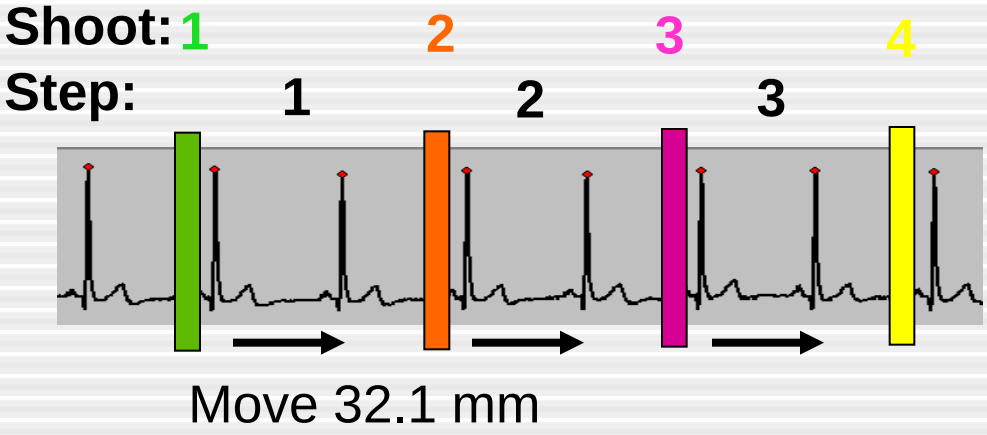
Synchronisation cardiaque rétrospective

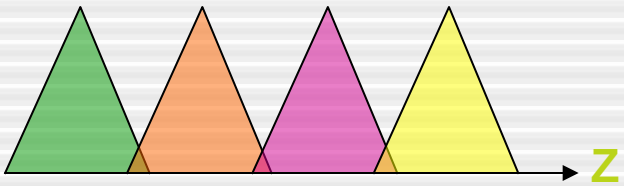


Synchronisation cardiaque rétrospective

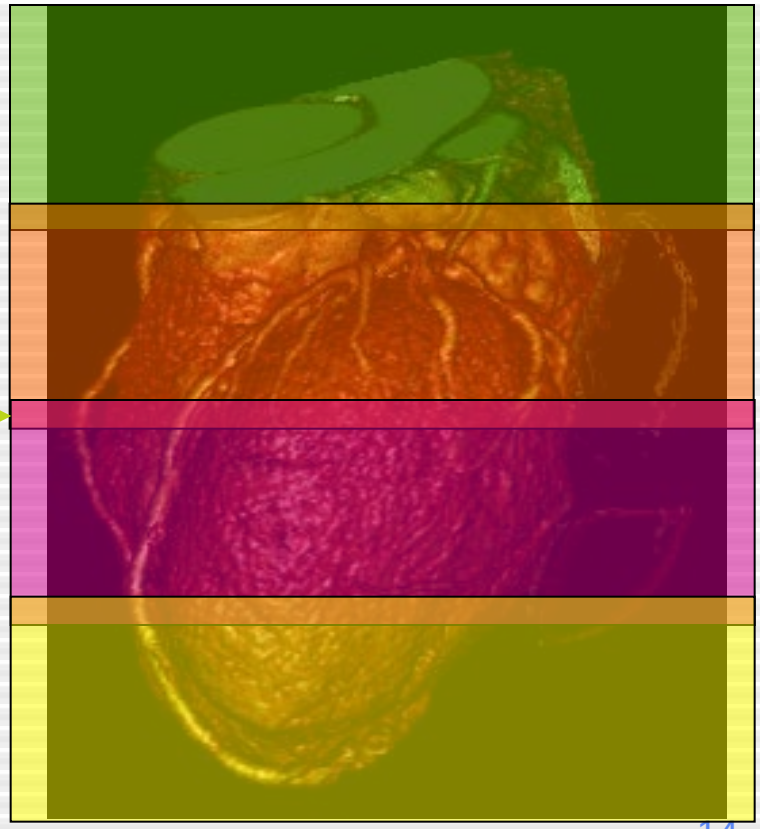


Principes du Step & Shoot

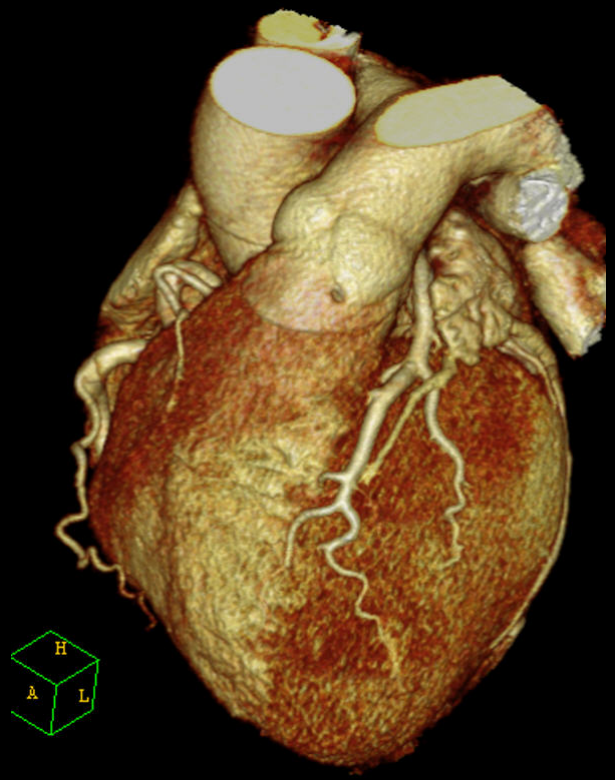




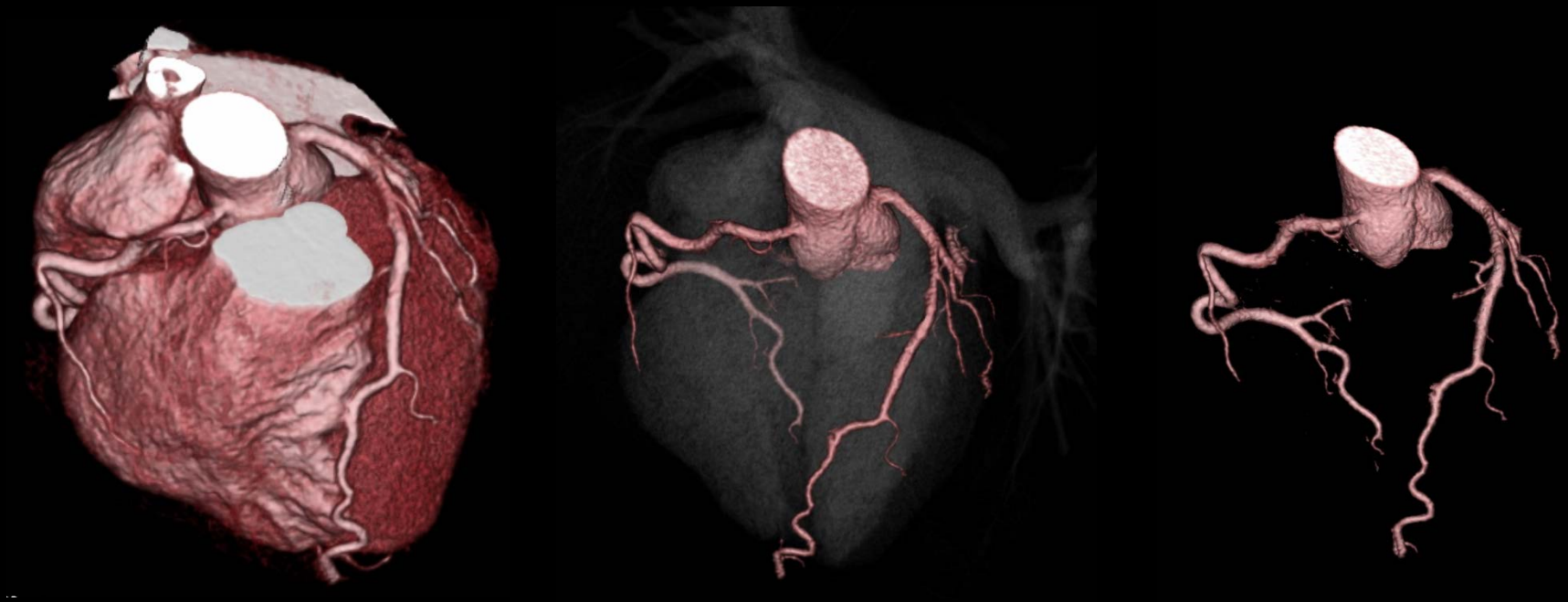
Step & Shoot Cardiac scan (4cm)



Acquisition spiralé avec synchronisation cardiaque rétrospective

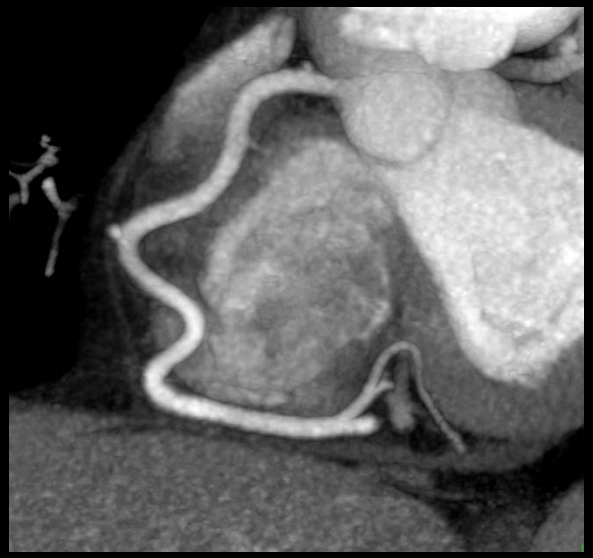


Post-Processing



64 x 0.625mm, Standard Res., RT = 0.42sec, Pitch = 0.2, Scan Time = 7.5 sec

Post-Processing



64 x 0.625mm, Standard Res., RT = 0.42sec, Pitch = 0.2, Scan Time = 7.5 sec

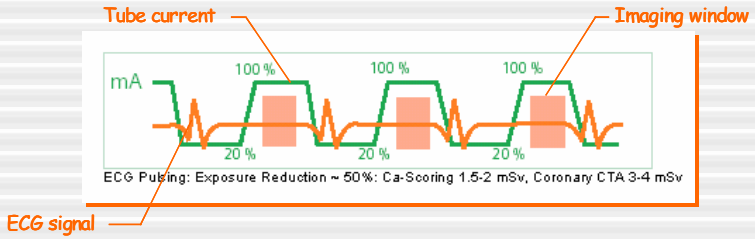

Comp. Cardiac
Coronaries
Hints
Vizualization Tools
Vessel Tools
Vessels
CX
RCA
LAD
CX
Diag1
Define Vessel
Show Centerline
Heart
Show Prot
Cardiac View
MIP
Windowing
Modified
Titles Off
Exit
Reset All
80.0% Phase
C: 294
W: 730
CARMEL^TREE1
1
80.0%
Carmel M.C.
Mx8000 IDT
7 Jul 2003
09:54:09.7
H
P
L
Ready
Can't set mark (1007)

Injection intraveineuse de produit de contraste

- Voie intraveineuse
  - Veine antécubitale
  - Contraste 350-400 mg I/mL
  - Débit: 4-5 mL/sec
  - ROI: Ao descendante
- Injecteur Double chambre
  - Diminution du produit de contraste injecté
  - Diminution artéfacts VCS (streak artefacts)

Recommandations pratiques

- Prise de ß bloquants (exception dual source?)
  - 1/2 co tenormin la veille de l'examen
  - 1/2 co le matin de l'examen
  - Obtenir un rythme cardiaque régulier ± 70/min
- Mise en place d'électrodes
  - Éviter les artefacts dans région d'intérêt
- Examen irradiant: indications à discuter
  - Modulation de dose en fct ECG
  - Appliquer si rythme <70/min



IrradiationMDCT

- 6.4± 1.9 mSv: 16-slice CT
- 11 ± 4.1 mSv: 64-slice CT
- ≈ 1 mSv: technique optimalisée
- Dose modulation:
  - 37-40%
- Dose modulation+diminution kV
  - 53-64%
- Dose coronarographie:
  - 2.1-2.5mSv

Hausleiter et al. Circulation Online Mars 2006

Hunold et al. Radiology 2003;226:145-152

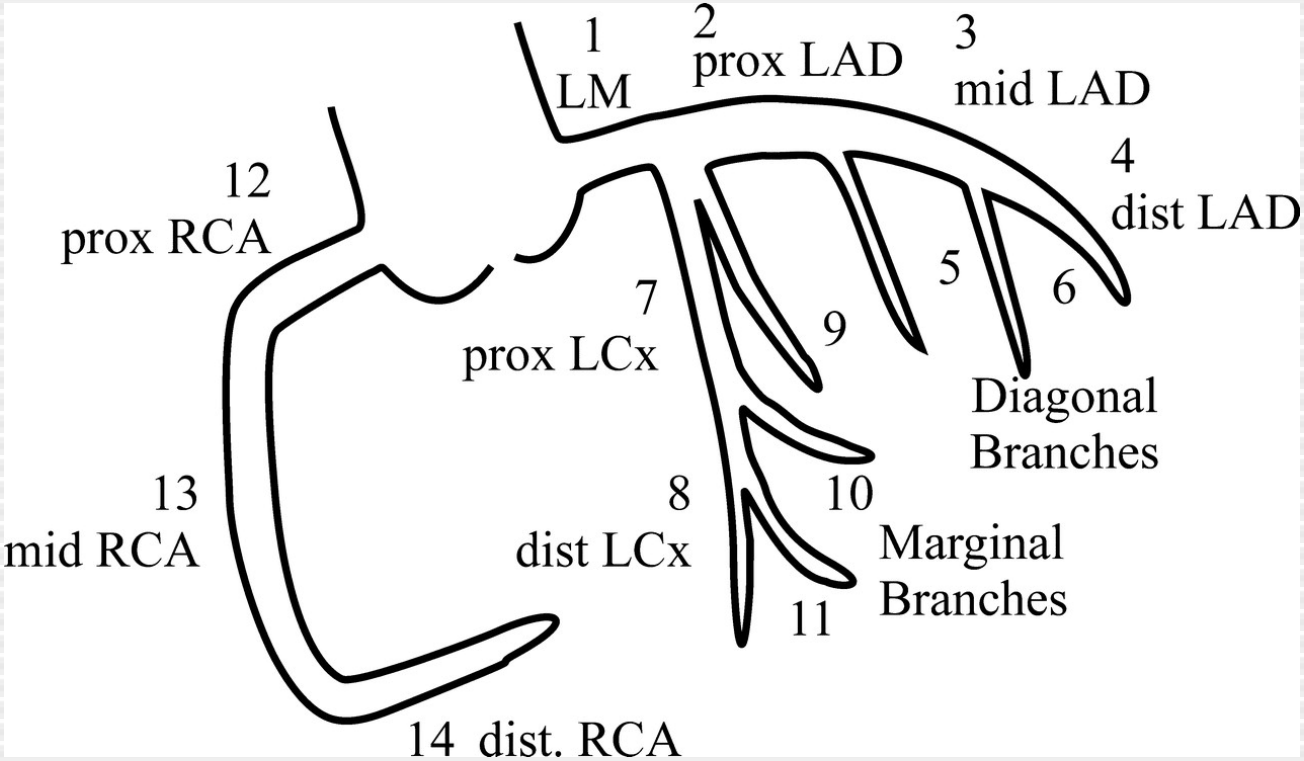
Effective Radiation Dosage, Measured in MilliSieverts (mSv)[3,4]

Average Background Dose – U.S.	3.6 mSv/year
Three-Hour Commercial Airline Flight	0.015 mSv
Pa & Lateral Chest X-Ray	0.05 mSv
Head CT Examination	1-2 mSv
Chest CT	5-7 mSv
Abdomen & Pelvis CT	6-8 mSv
Selective Diagnostic Coronary Angiography	3-6 mSv
Diagnostic Coronary Angiography with Intervention	6-30 mSv
Nuclear Medicine Stress Test	
SPECT Thallium	25.3 mSv
SPECT Sestamibi	12.2 mSv
Coronary CT Angiography	
Retrospective CCTA	13 mSv
Retrospective EKG-Modulated CCTA	8-9 mSv
Prospective “Step-and-Shoot” CCTA	2-3 mSv

Performances diagnostiques du CT coronaire

Authors	N Pts	Sensitivity %	Specificity %	PPV %	NPV %	segments not seen %
Nieman Lancet.2001; 357	35	77	97	81	97	27
Achenbach Circulation.2001 ; 103	64	85	76	59	98	32
Gerber Invest Radio.2003; 38	25	82	96	73	97	30
Knez Am J Cardiol.2001; 88	44	78	98	85	96	6
Kopp Eur Heart J.2002 ; 23	102	93	97	81	99	0-30
Giesler AJR.2002 ; 179	100	91	89	66	98	29
Nieman Circulation.2002 ; 106	59	95	86	80	97	-
Ropers Circulation.2003 ; 107	77	92	93	79	97	-
Dewey Invest Radio.2004; 39	34	88	91	88	95	-
Leschka (64-slice CT) Eur heart Journal 2005	67	94	97	87	99	0

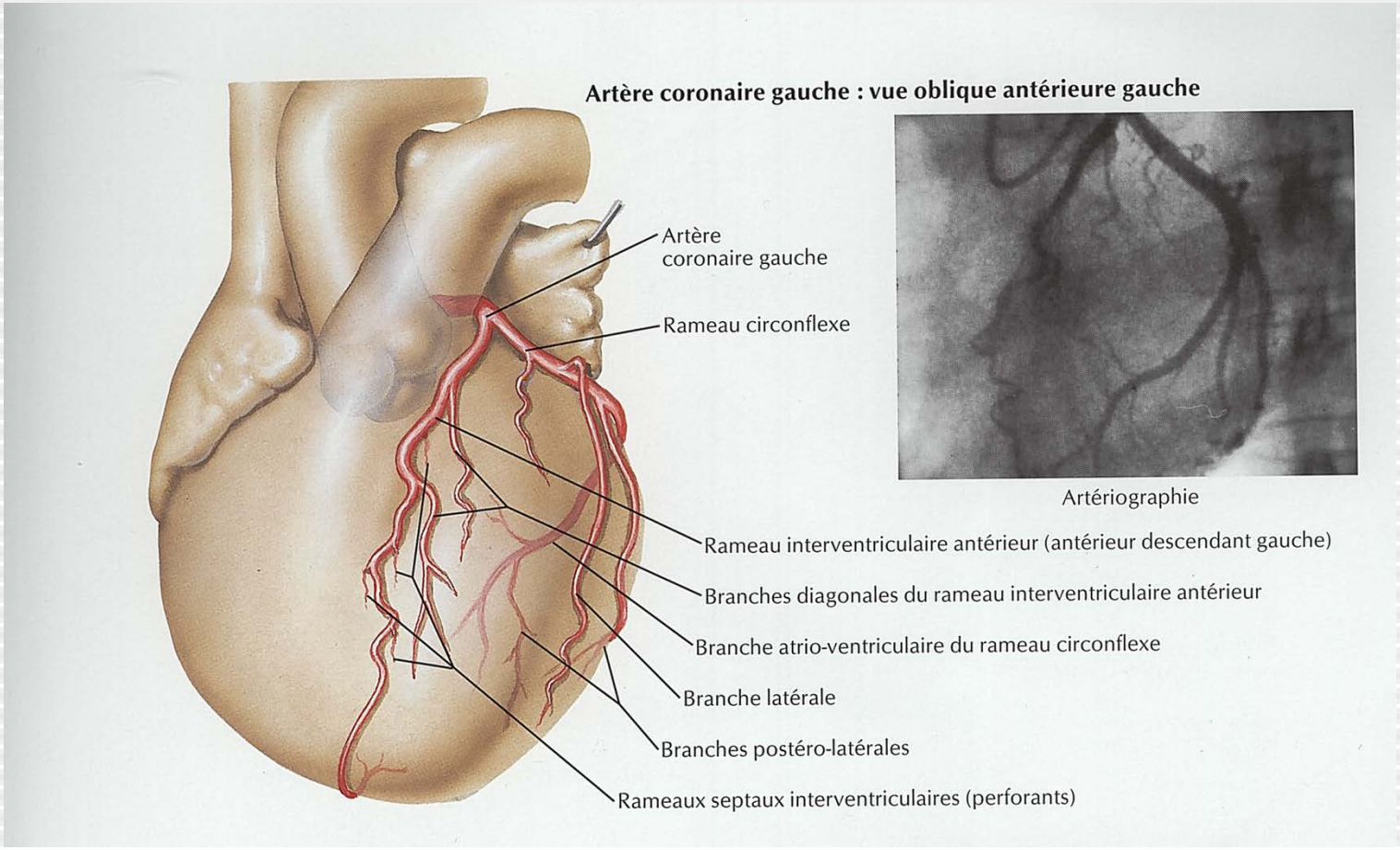
Evaluation des artères coronaires

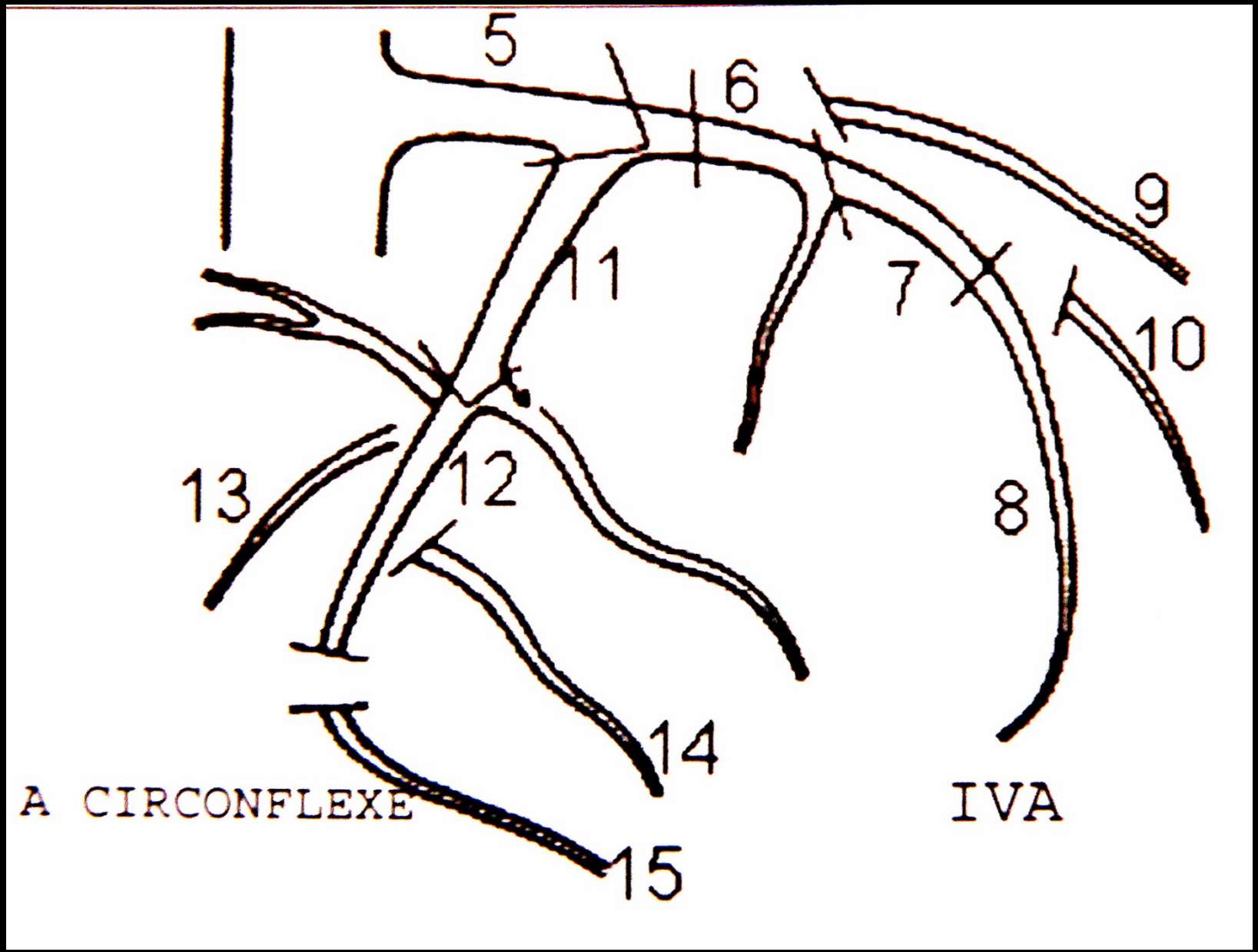


Interprétation conjointe radiologue-cardiologue

Bien analyser les anomalies extra-cardiaques!!

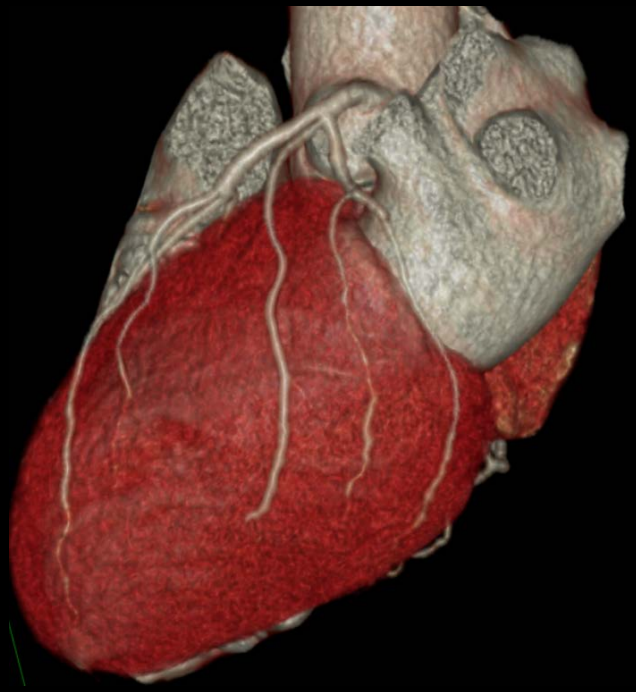
Anatomie des artères coronaires

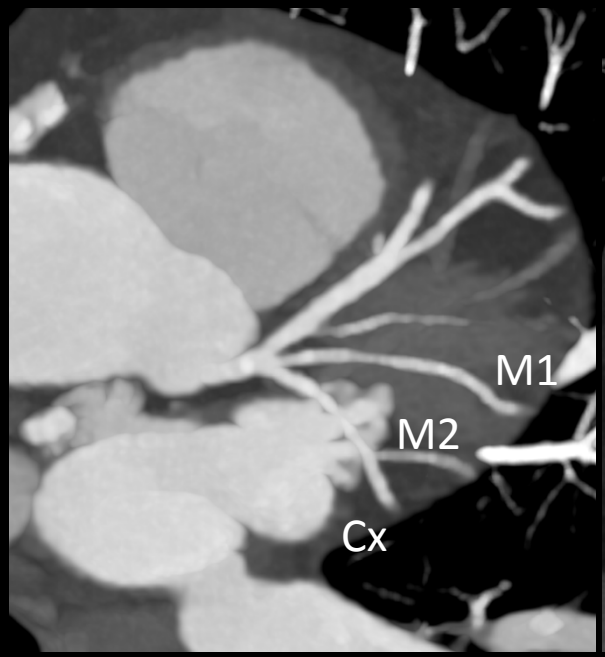



5
6
9
11
7
10
13
12
8
14
15
A CIRCONFLEXE
IVA

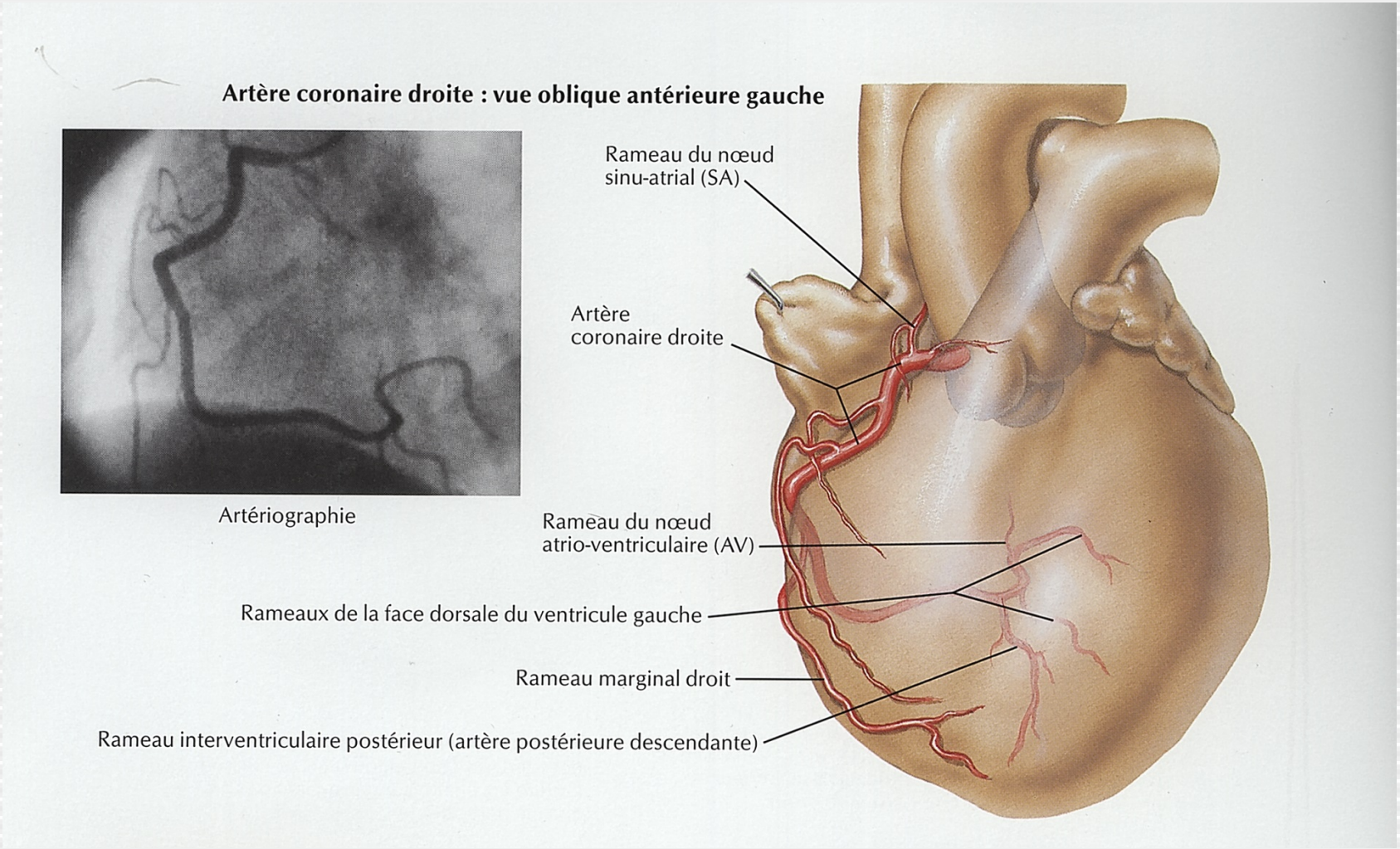
Artère circonflexe

- naissance du tronc commun
- sillon AV gauche
- 1 à 2 marginales : paroi latérale du VG
- (RVG/IVP : selon dominance)

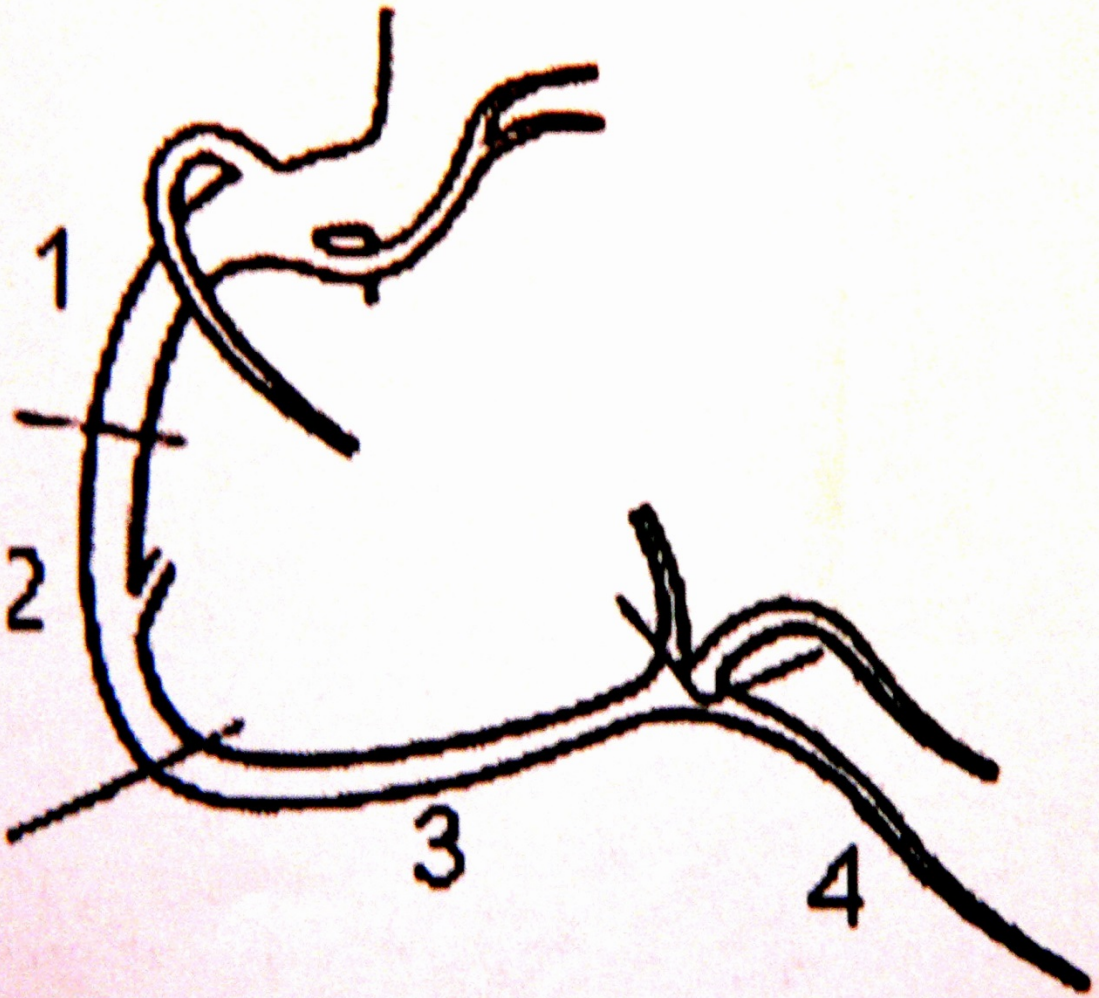




Anatomie des artères coronaires

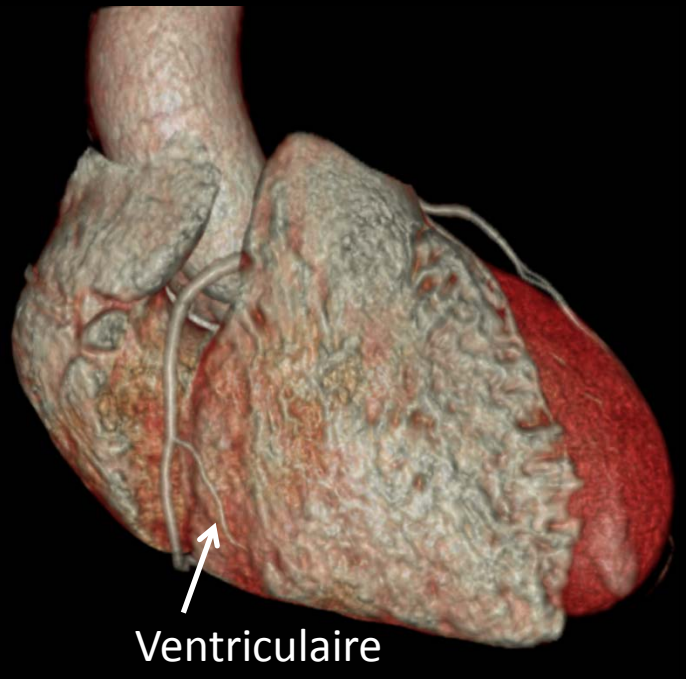


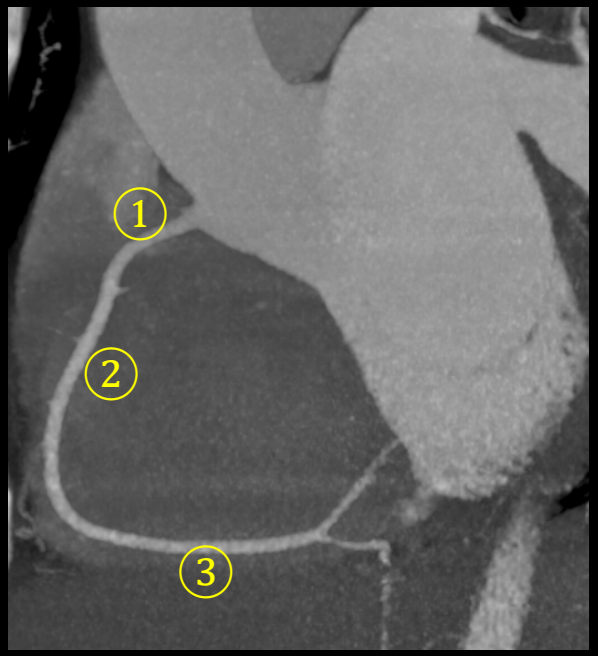
A coronaire D

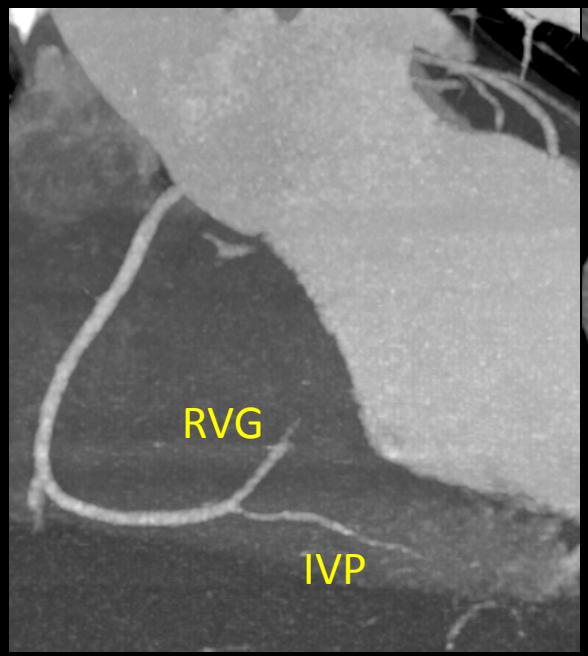


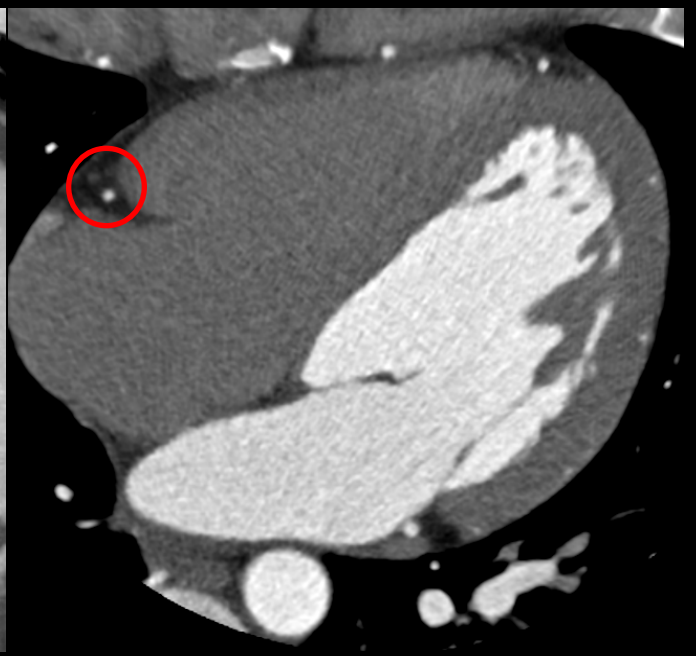
Artère coronaire D

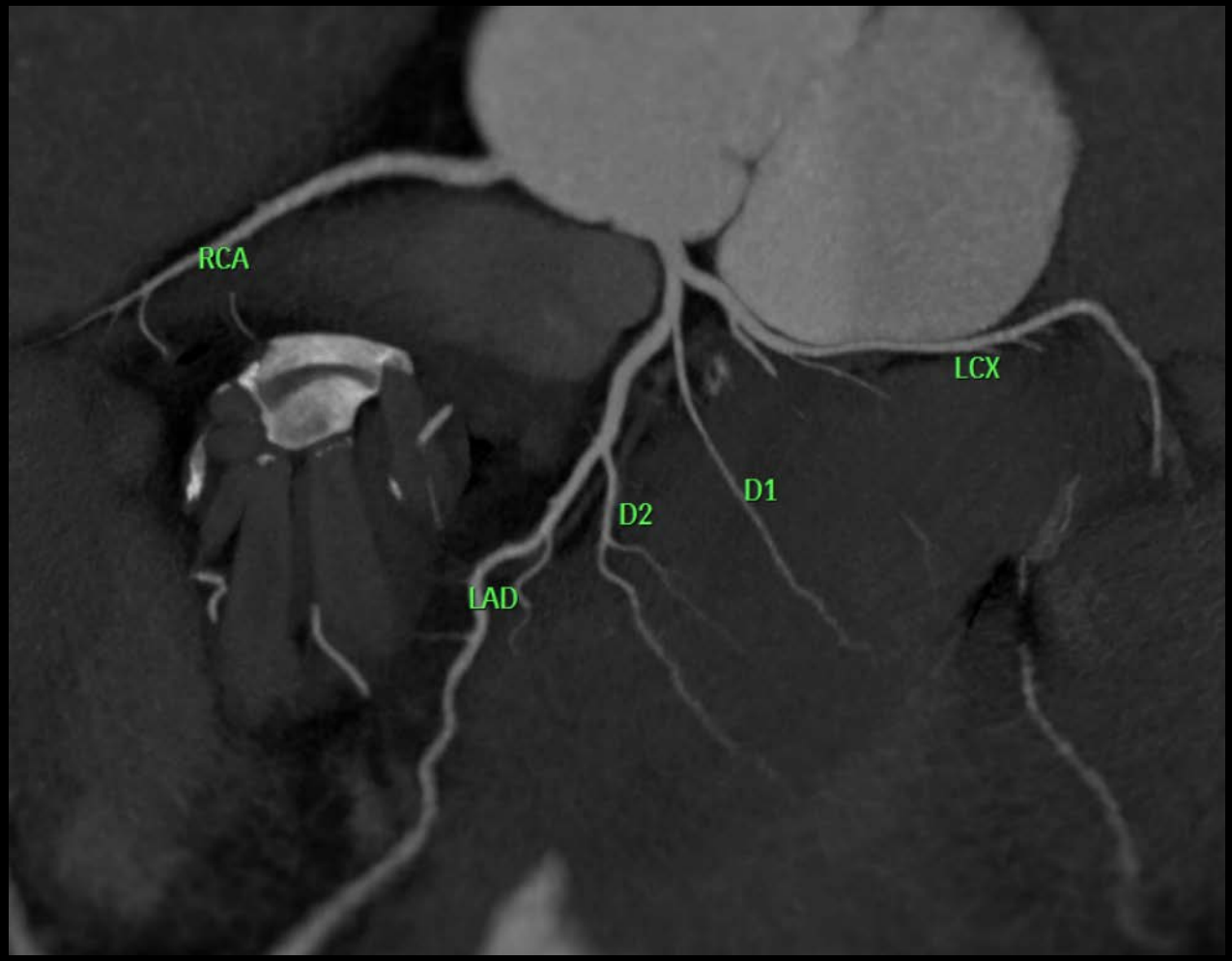
- naissance du sinus coronaire droit
- sillon AV droit
- 3 segments : horizontal – vertical – horizontal
- 1 branche ventriculaire (« marginale D »)
- fin : IVP – RVG (selon dominance)



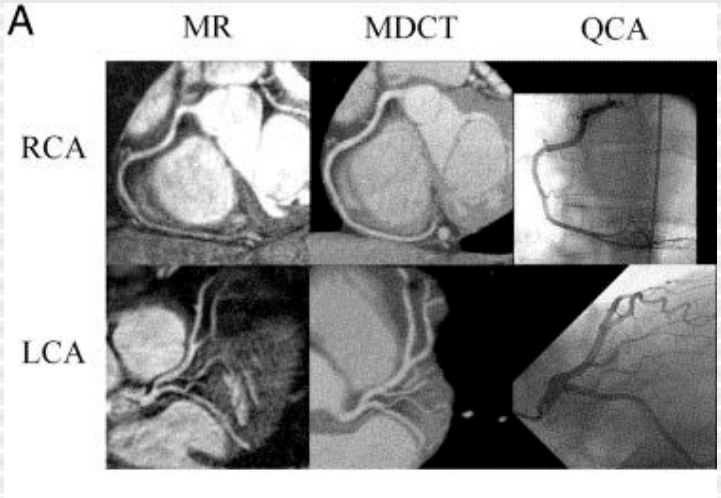


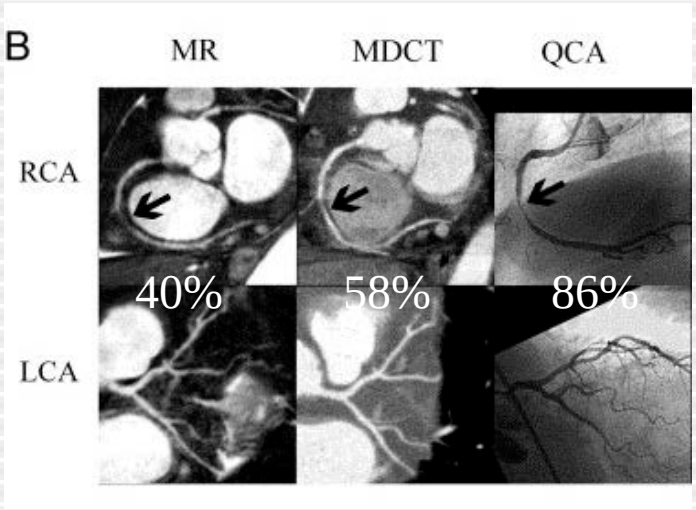


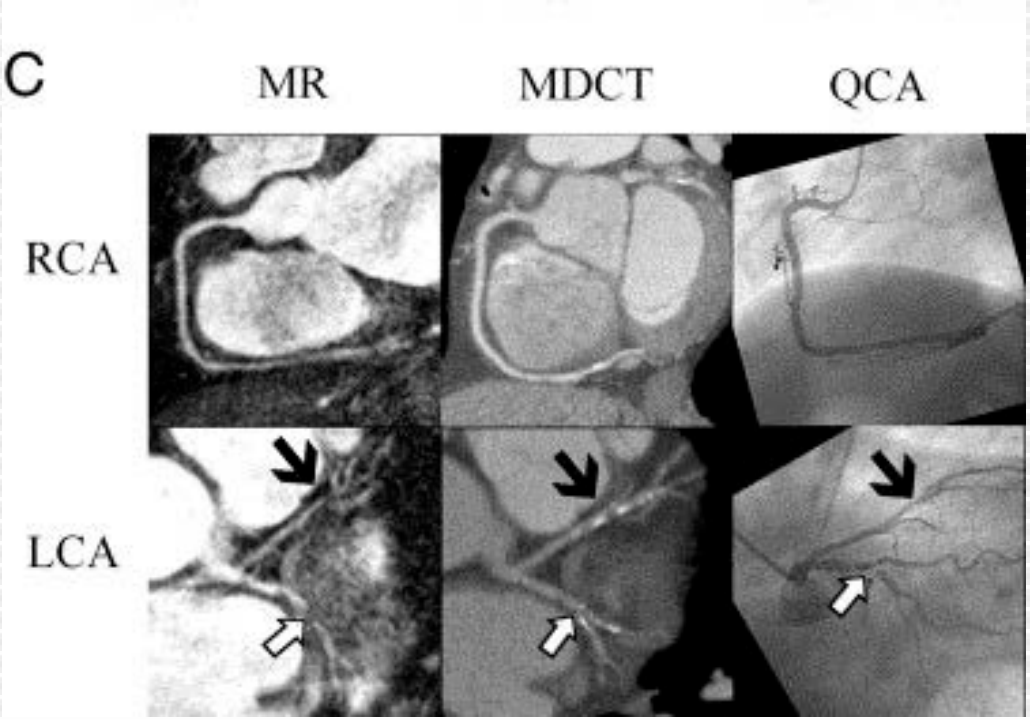



RCA
LCX
D1
D2
LAD

MDCT ou IRM?







37%	51%	52%
64%	57%	79%

Sens MR, MDCT: 75%, 85%; spec MR, MDCT:77%, 79%

Kefer J, Coche E, Gabin L, et al. JACC 2005

MDCT ou IRM?

MDCT: Meilleure résolution spatiale et temporelle

Imagerie des coronaires

Calcium: artefacts d'éblouissement

Irradiation: optimisation! PDC: allergie

IRM: Meilleure résolution en densité

Analyse des tissus et fonction cardiaque

Pace-maker et corps métalliques!

Indications reconnues

- Présentation clinique atypique
- Bilan chez patients avec facteurs de risque cardio-vasculaire
- Echec de la coronarographie
- Evaluation des pontages artériels et veineux
- Contrôle post-ablation FA
- Evaluation des stents
- Bilan d’extension tumeur cardiaque

Présentations cliniques atypiques

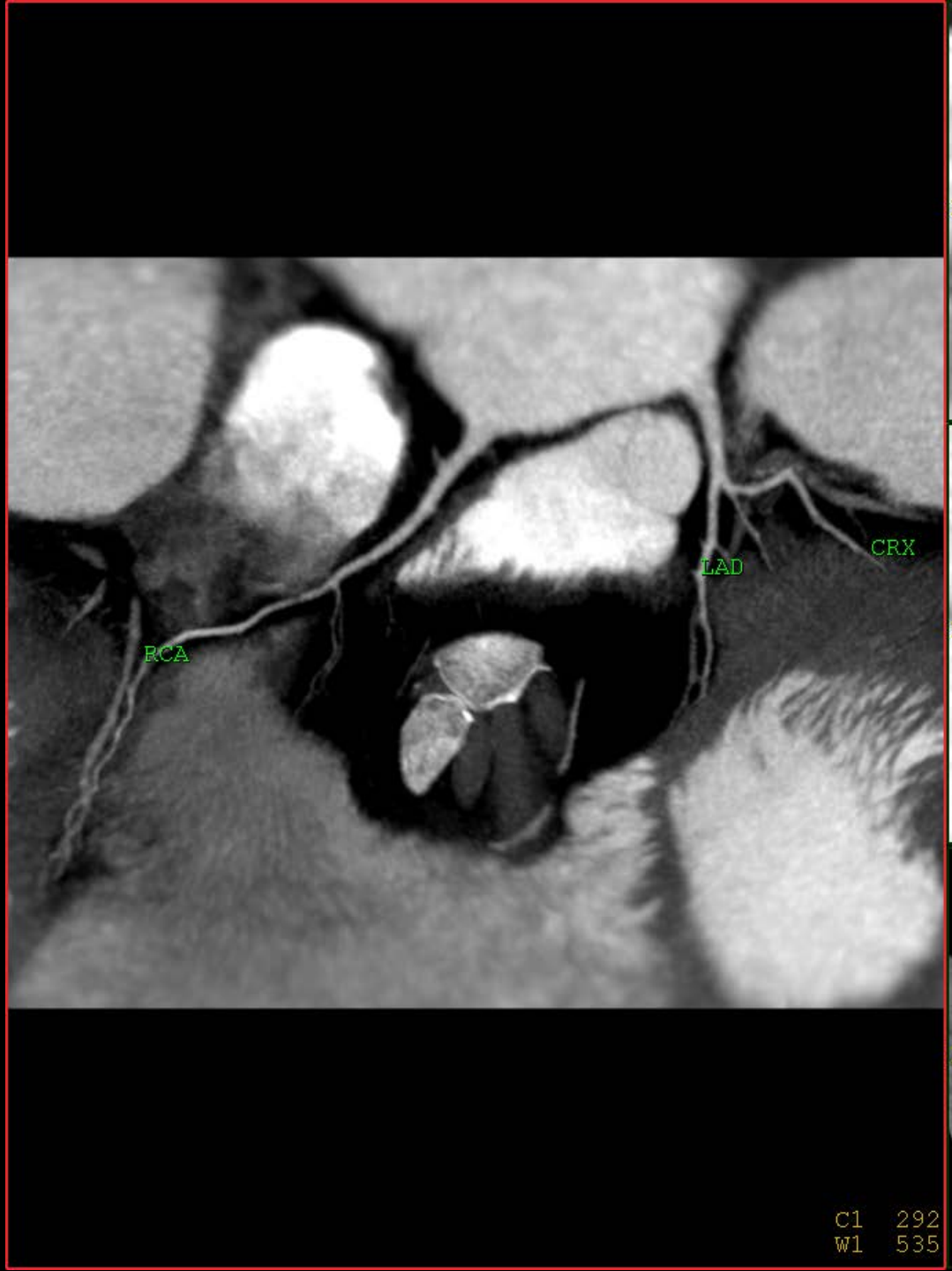
- Douleurs thoraciques atypiques
- Anomalies aspécifiques de l'examen scintigraphique
  - hypofixation antérieure chez femme de 50 ans pex.
- Anomalies atypiques de l'ECG au repos ou à l'effort

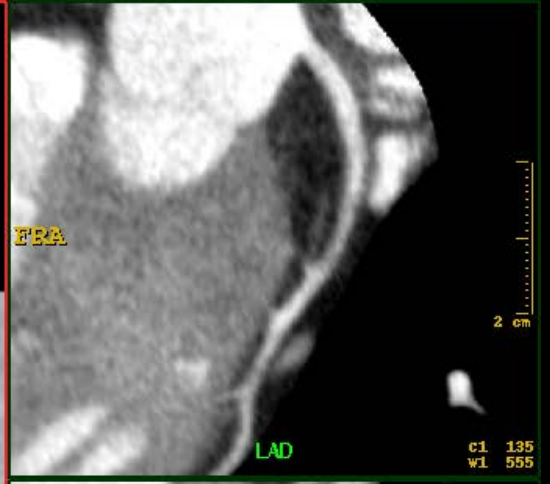
Cas clinique

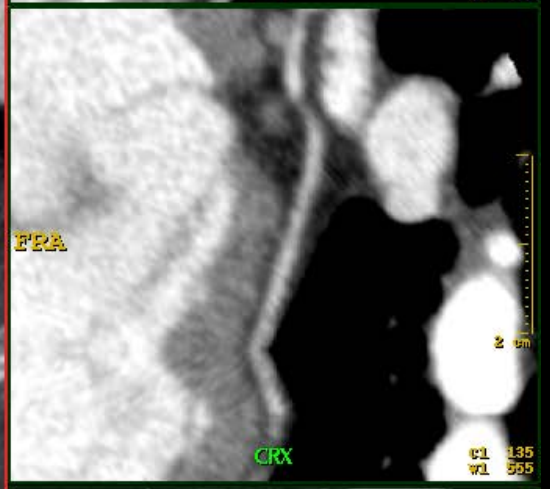
Jeune femme de 28 ans

Douleurs thoraciques suspectes

Hypokinésie inférieure à l'écho


RCA
LAD
CRX
C1 292
W1 535


FRA
LAD
2 cm
C1 135
W1 555


FRA
CRX
2 cm
C1 135
W1 555


FRA
RCA
C1 135
W1 555

Indications reconnues

- Présentation clinique atypique
- Bilan chez patients avec facteurs de risque cardio-vasculaire
- Echec de la coronarographie
- Evaluation des pontages artériels et veineux
- Evaluation des stents
- Contrôle post-ablation FA
- Bilan d’extension tumeur cardiaque

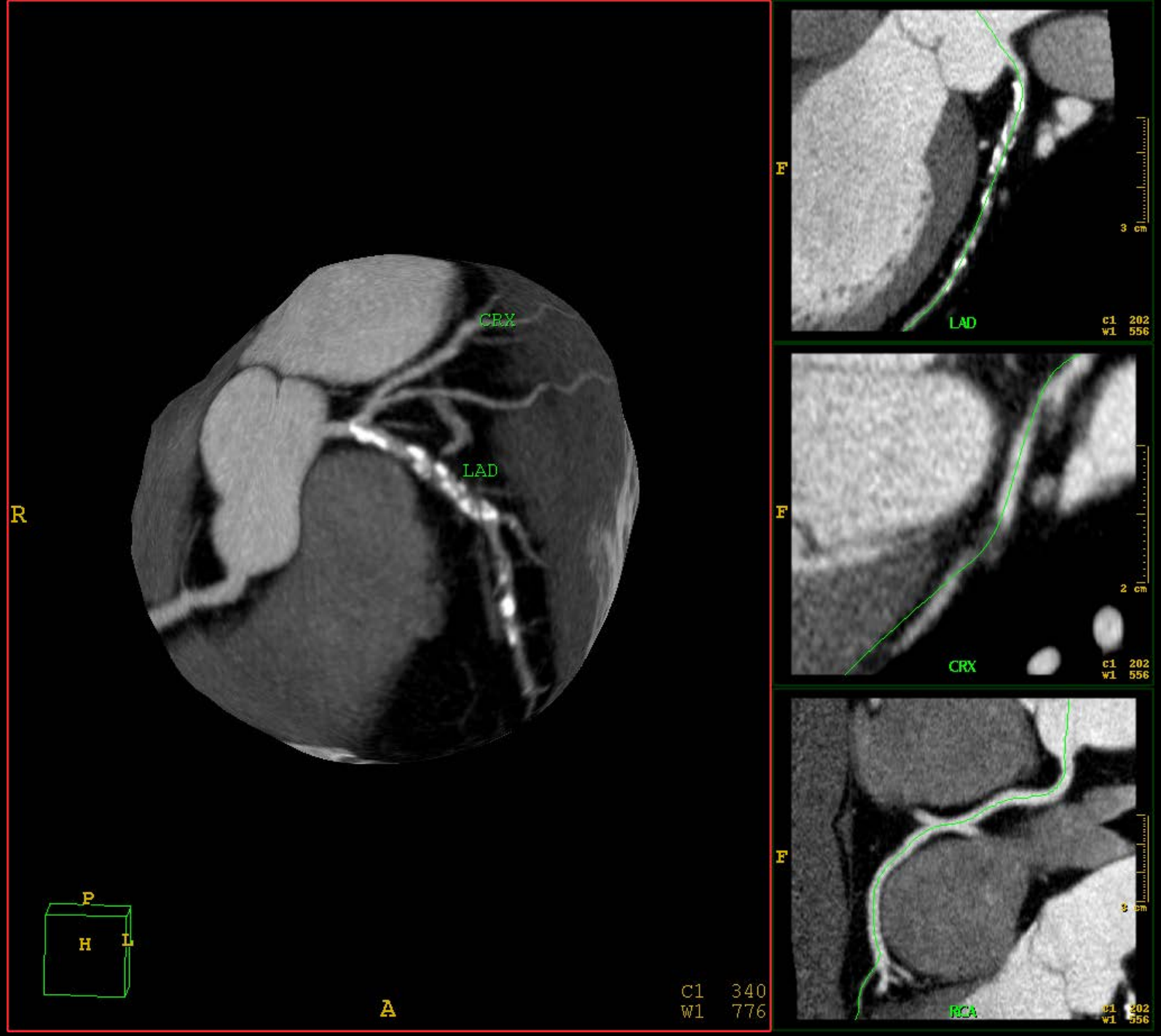
Cas clinique

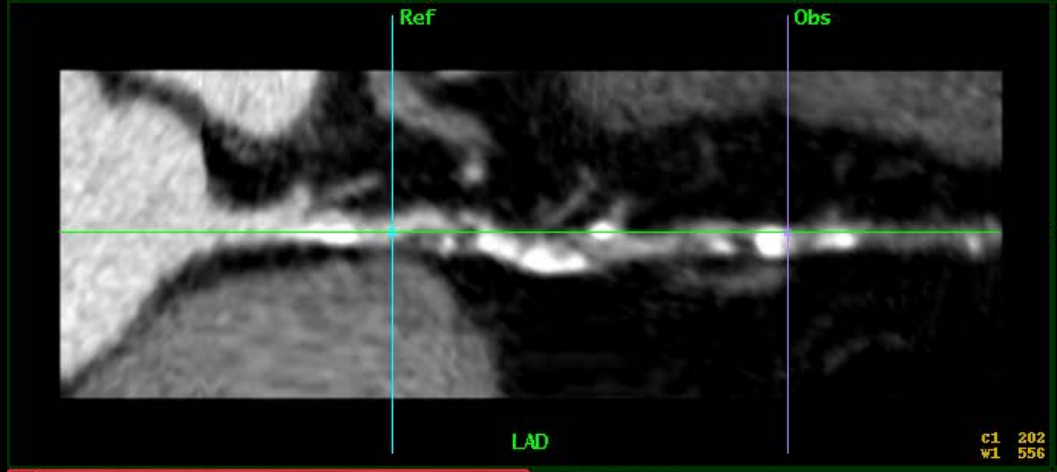
Homme de 54 ans

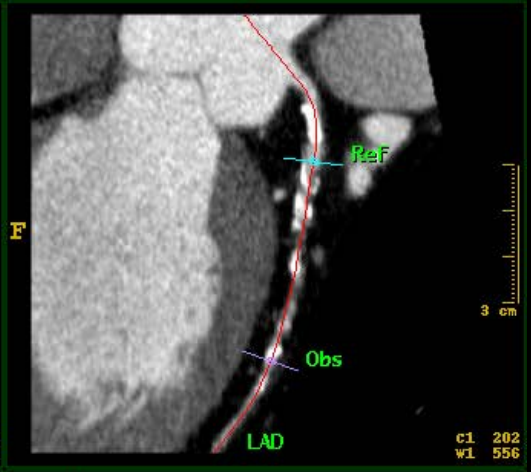
Dyslipidémie mixte

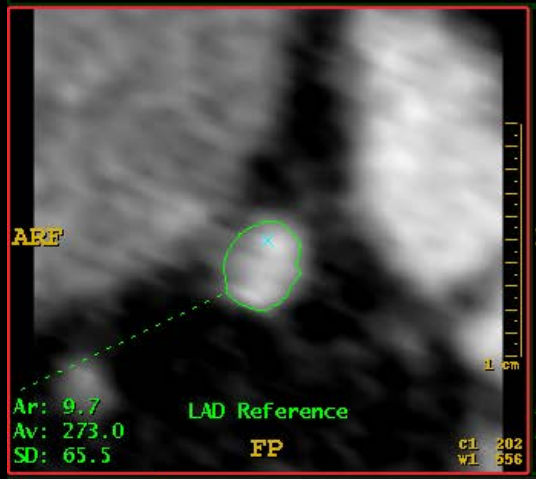
HTA diastolique

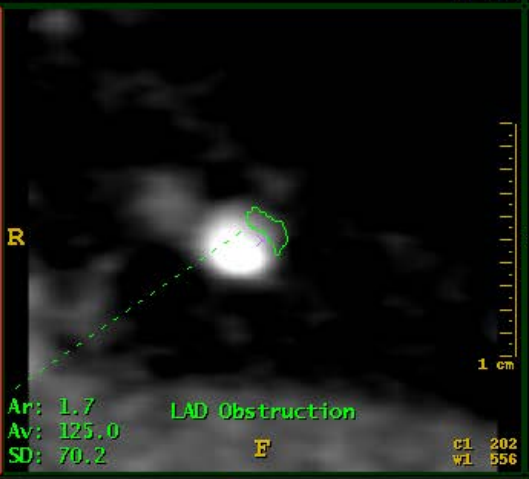
Maladie cardio-vasculaire dans la famille

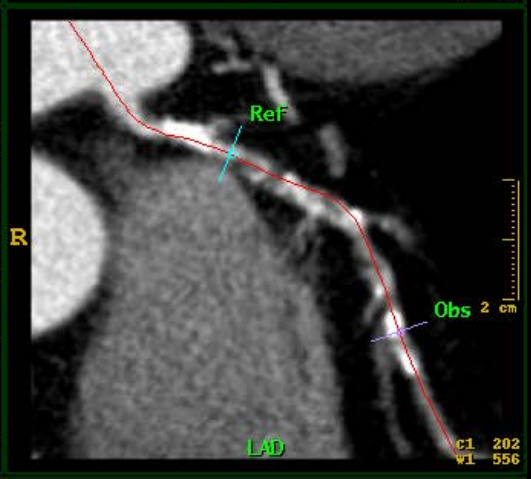

CRX
LAD
R
P
H
L
A
C1 340
W1 776
F
LAD
3 cm
c1 202
w1 556
F
CRX
2 cm
c1 202
w1 556
F
RCA
c1 202
w1 556





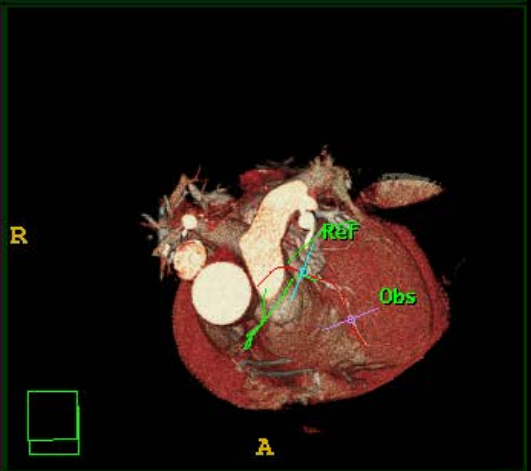






	Reference	Obstruction	% Stenosis
Effective Diameter (mm)	3.5	1.5	59
Lumen Area (mm^2)	9.7	1.7	83
Position (mm)	37.0	81.0	

Distance : 44.1 mm



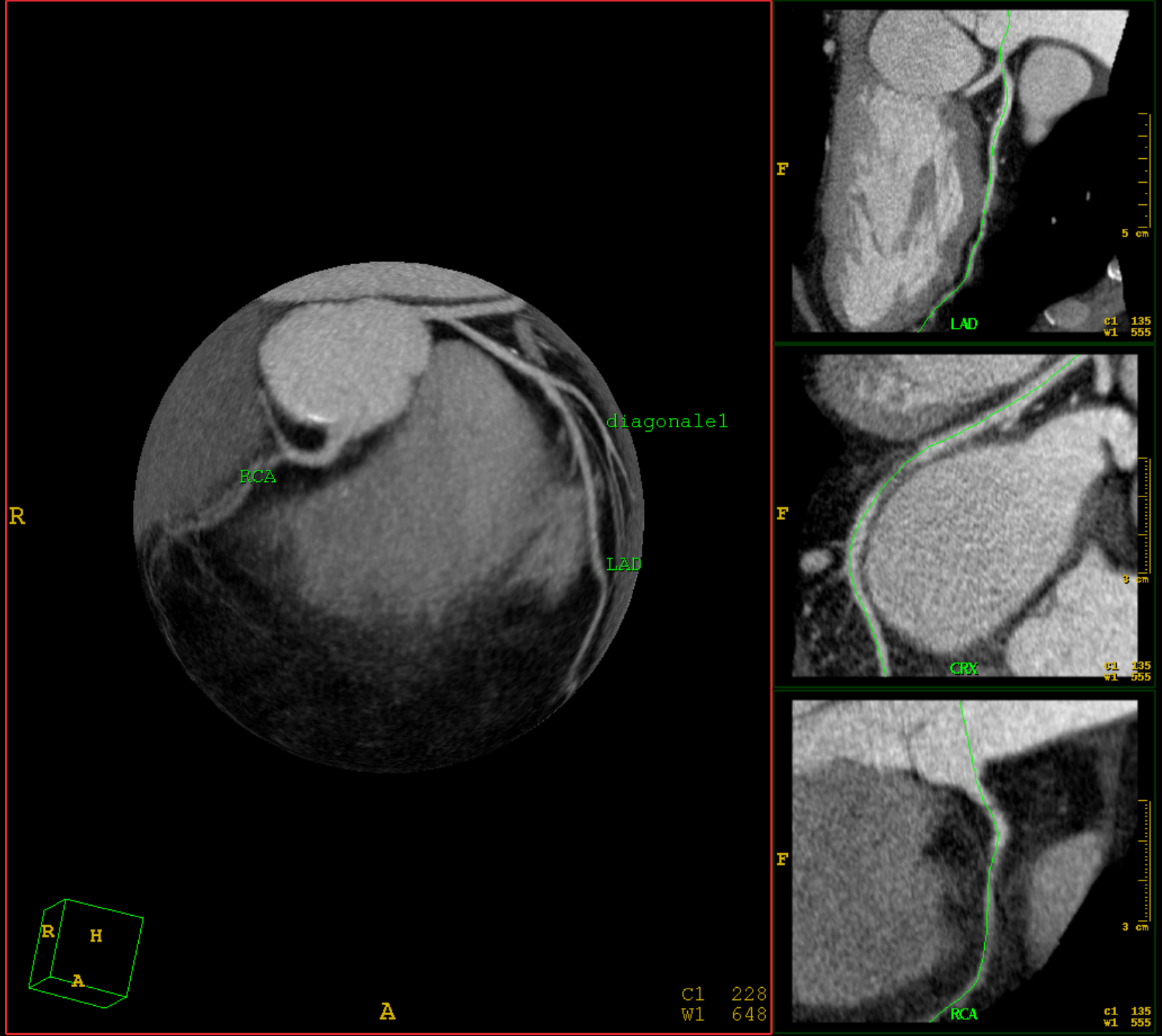
Cas clinique

Homme de 50 ans

Diabète de type II

Anomalies ECG à l'effort

Pas d'anomalies scintigraphiques


RCA
diagonale1
LAD
R
A
R
H
A
C1 228
W1 648
F
LAD
5 cm
C1 135
W1 555
F
CRX
3 cm
C1 135
W1 555
F
RCA
3 cm
C1 135
W1 555

Indications reconnues

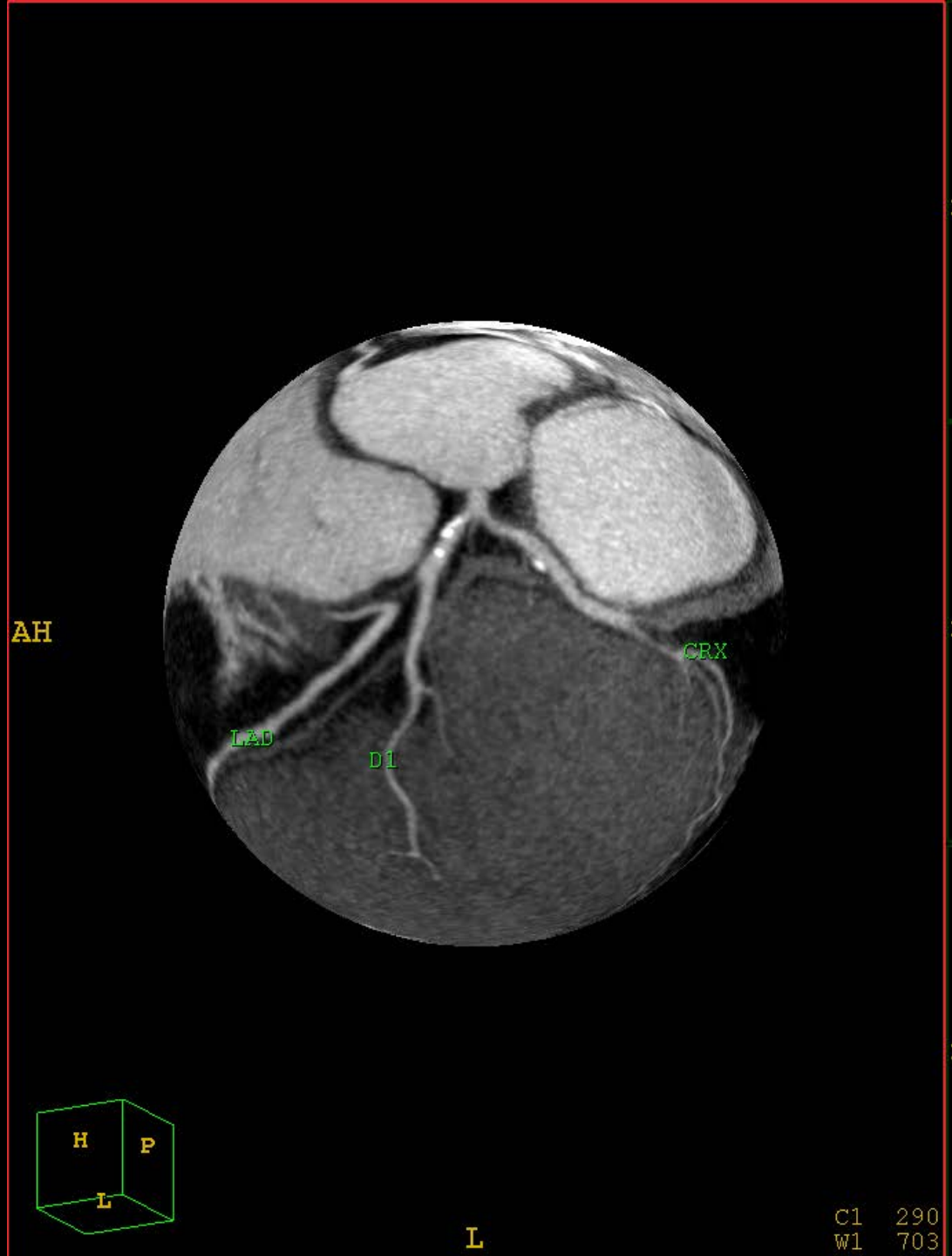
- Présentation clinique atypique
- Bilan chez patients avec facteurs de risque cardio-vasculaire
- Echec de la coronarographie ou anomalie mal visualisée
- Evaluation des pontages artériels et veineux
- Contrôle post-ablation FA
- Evaluation des stents
- Bilan d'extension tumeur cardiaque

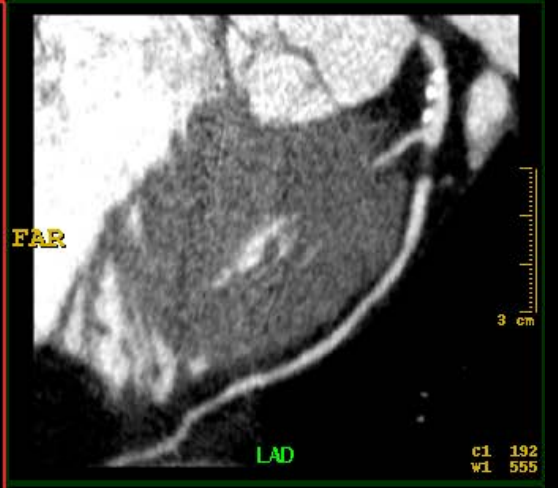
Cas clinique

Homme de 56 ans

Sténose serrée de l'IVA aux USA

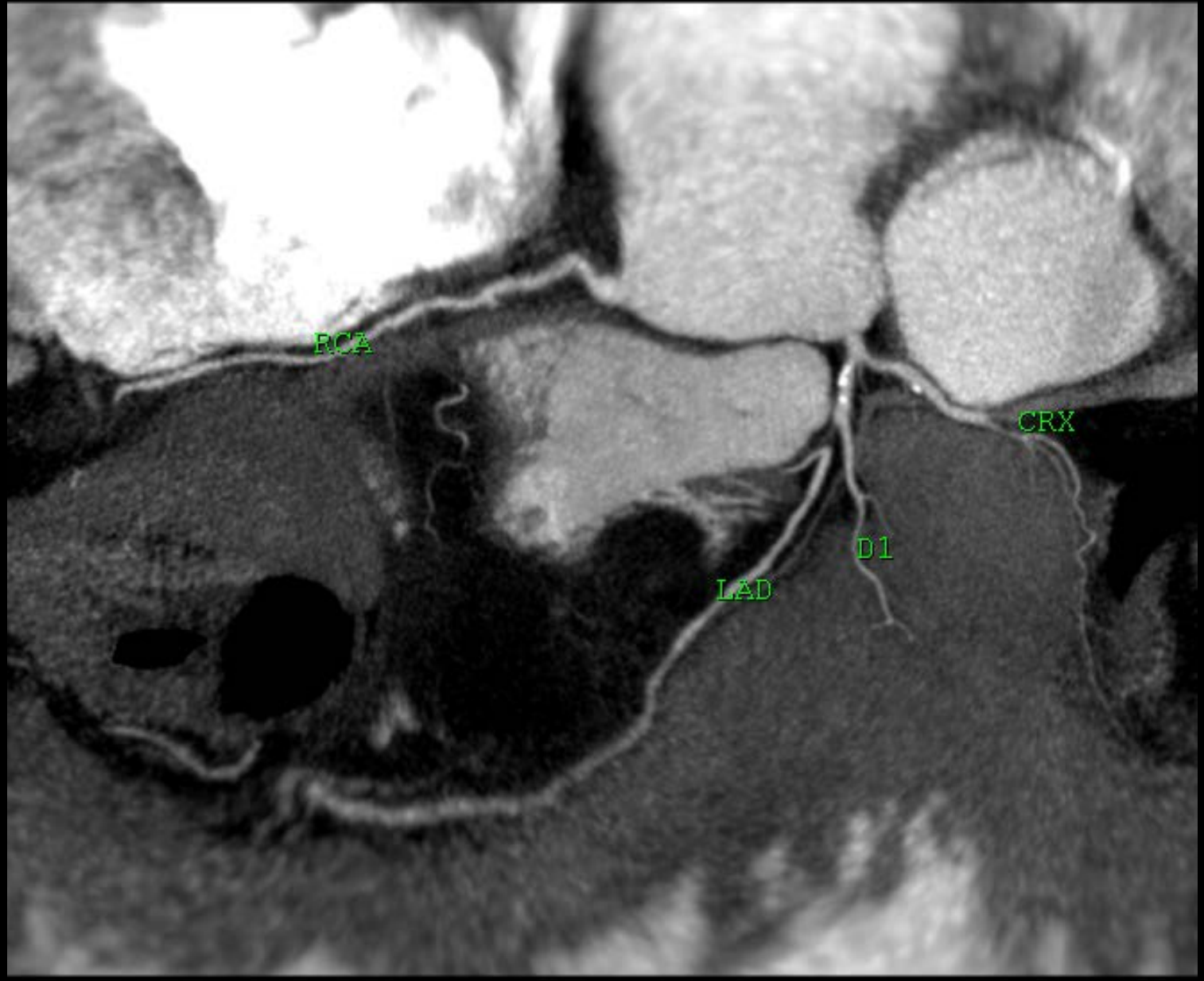
Contrôle


AH
LAD
D1
CRX
H
P
L
L
C1 290
W1 703


FAR
3 cm
LAD
C1 192
W1 555

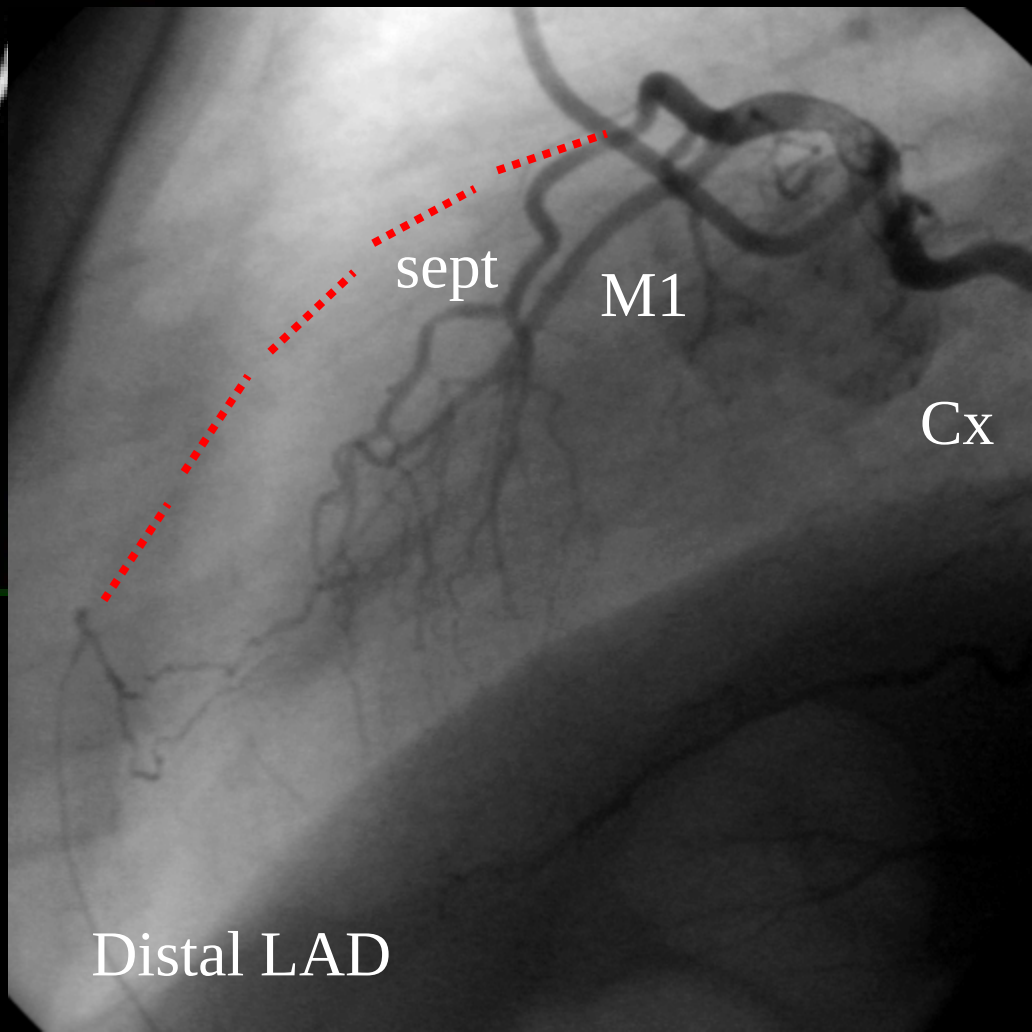

FAR
3 cm
CRX
C1 192
W1 555


FAR
3 cm
RCA
C1 192

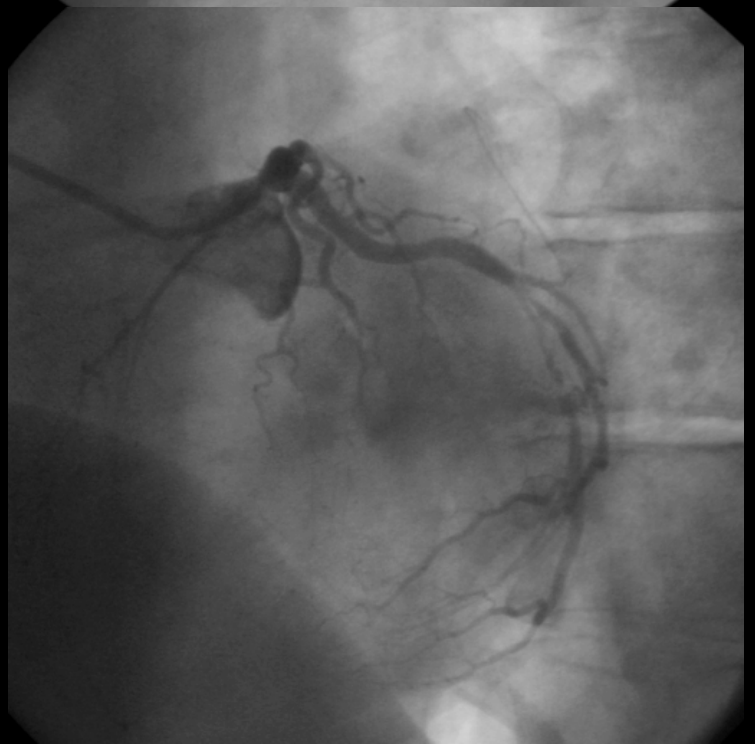


Occlusion of the proximal LAD


LAD


sept
M1
Cx
Distal LAD


CRX
D1
LAD



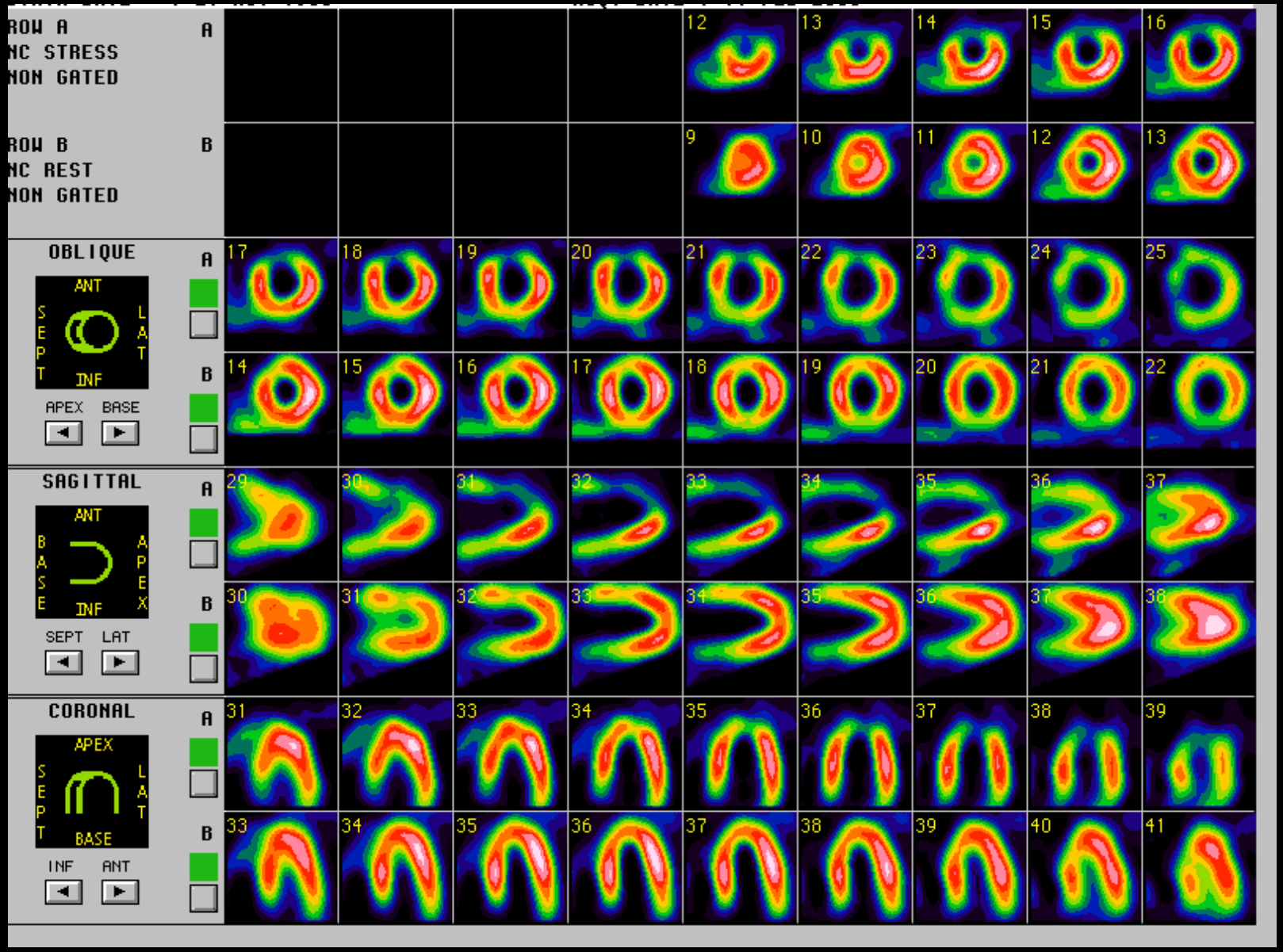
Cas clinique

Homme de 38 ans

Douleurs précordiales à l'effort

Scinti + coronarographie

Tc 99 m-Sestamibi SPECT



Courtesy of Clinique Ste Thérèse-Luxemburg


Image size: 512 x 512
View size: 1138 x 638
X: 0 px Y: 0 px Value: 0
WL: 96 WW: 124
CAR1 1004
1
Cons LD
255
96
0
Im: 35/403
Zoom: 1.205 Angle: 0
Thickness: 0.0 mm Location: 0.0
X: 0.000 mm Y: 0.000 mm Z: 0.00 mm

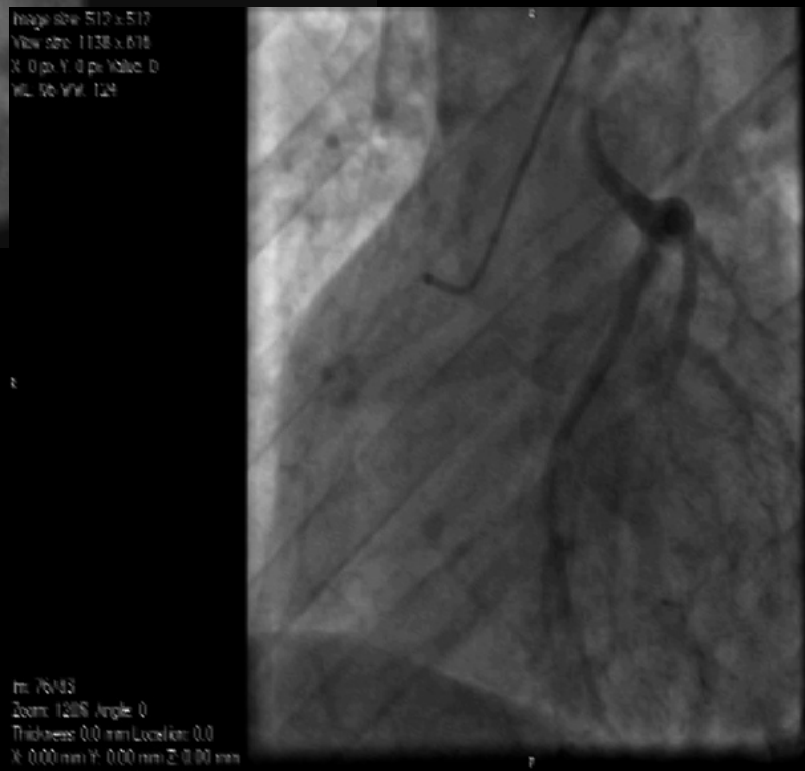
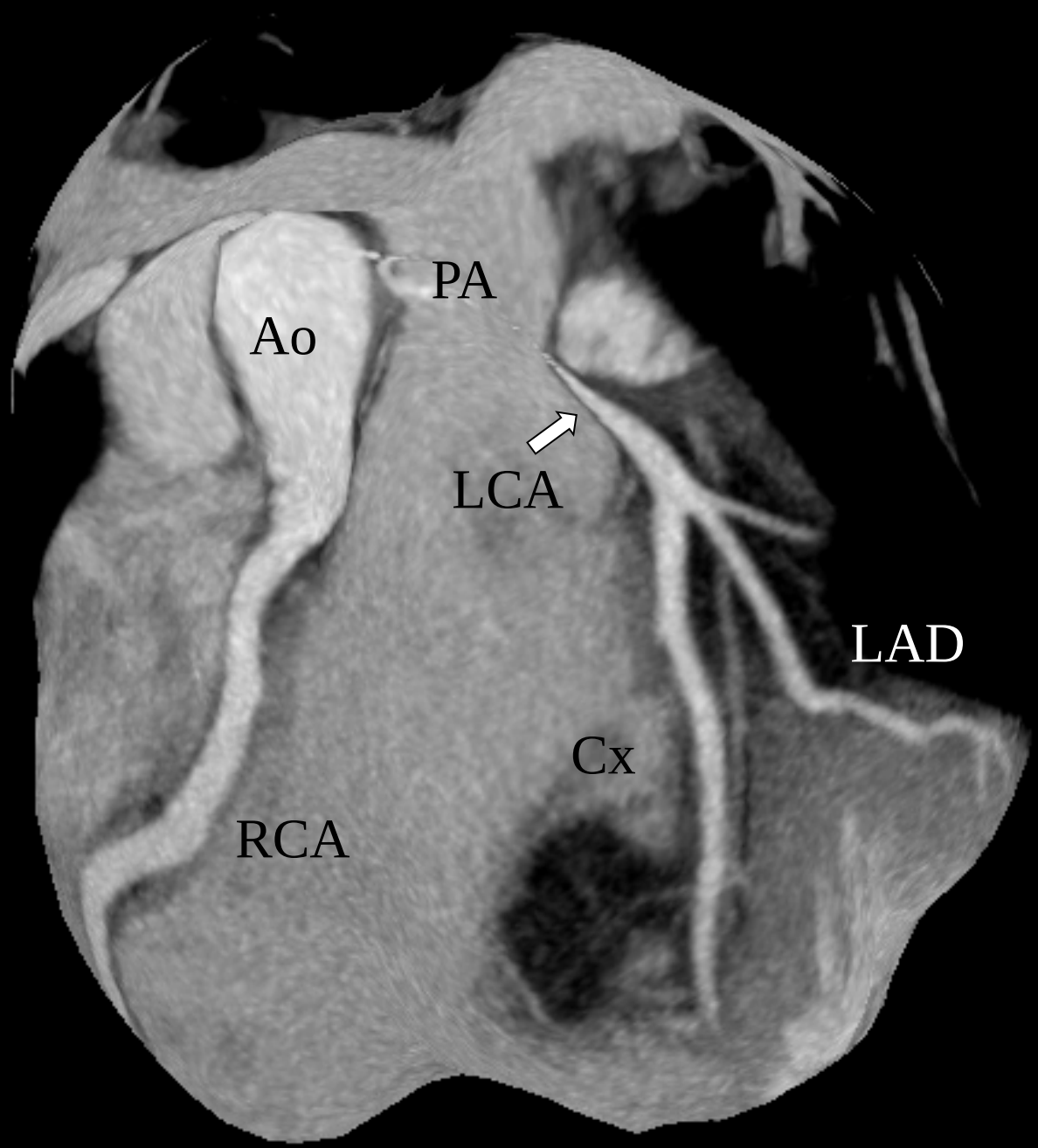
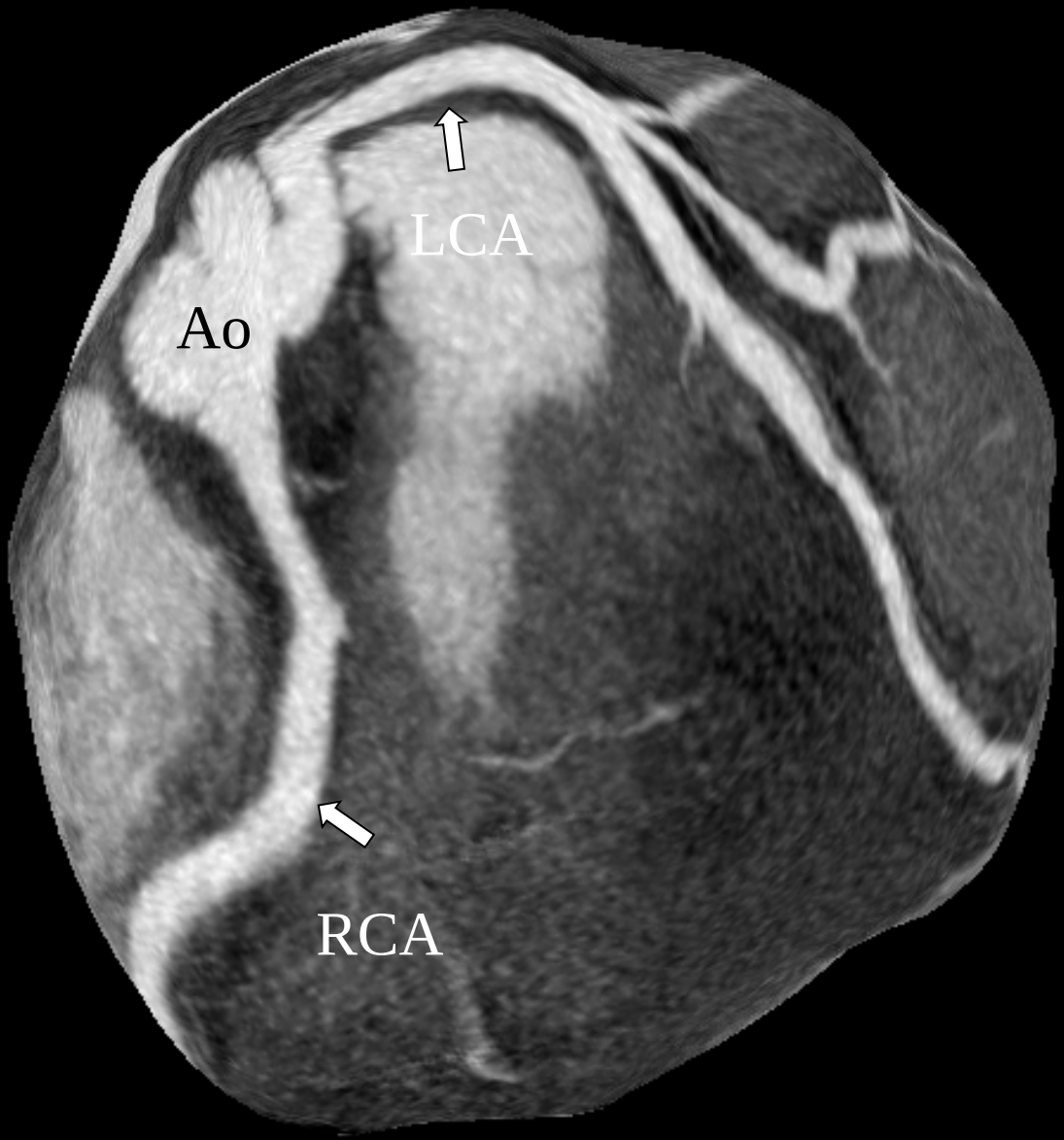


Image size: 512 x 512
View size: 1138 x 638
X: 0 px Y: 0 px Value: 0
WL: 96 WW: 124
CAR1 1004
1
Cons LD
255
96
0
Im: 75/403
Zoom: 1.205 Angle: 0
Thickness: 0.0 mm Location: 0.0
X: 0.000 mm Y: 0.000 mm Z: 0.00 mm


PA
Ao
LCA
LAD
Cx
RCA



Correction post-chirurgicale

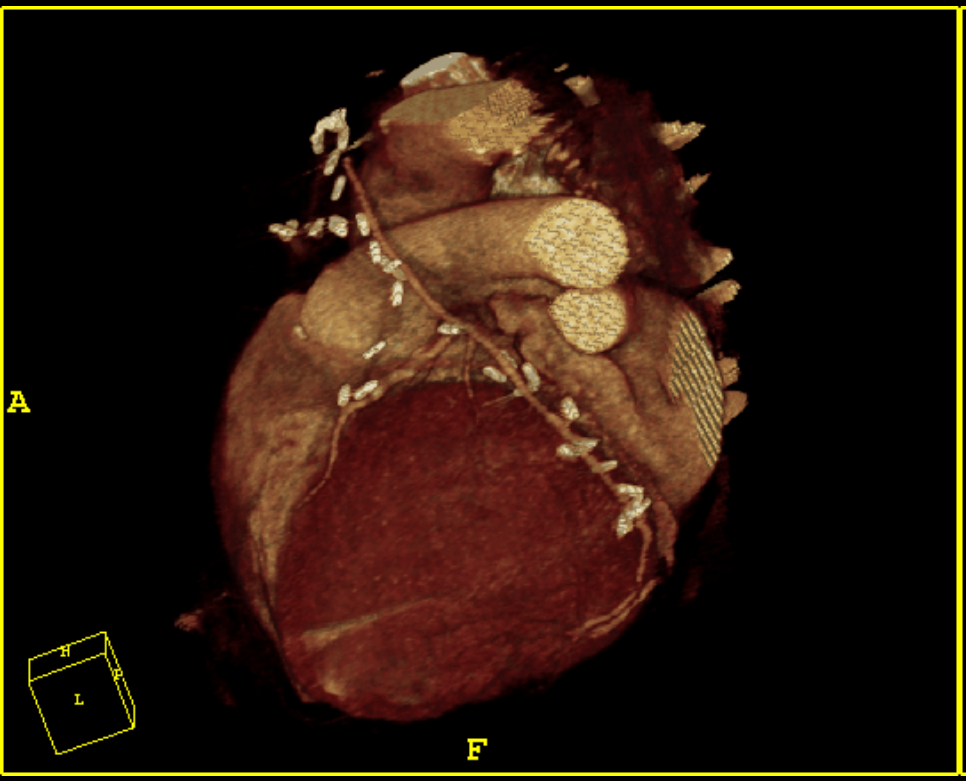
Indications reconnues

- Présentation clinique atypique
- Bilan chez patients avec facteurs de risque cardio-vasculaire
- Echec de la coronarographie
- Evaluation des pontages artériels et veineux
- Contrôle post-ablation FA
- Evaluation des stents
- Bilan d’extension tumeur cardiaque

Pontages veineux et artériels

- ✓-Bonne évaluation des pontages veineux et artériels
- ✓-48 patients consécutifs, 131 pontages
- ✓-74% des anastomoses distales peuvent être évaluées
- ✓-Occlusions sont aisément détectées
- ✓-Sensibilité: 96%, spécificité: 95%, PPV: 81%, NPV: 99%

Thomas Schlosser et al. Noninvasive visualization of coronary artery bypass grafts using 16-detector row computed tomography. J Am Coll Cardiol. 2004 Sep 15;44(6):1224-9.


A
H
L
F
F


R
H
R
A
AF

Indications reconnues

- Présentation clinique atypique
- Bilan chez patients avec facteurs de risque cardio-vasculaire
- Echec de la coronarographie
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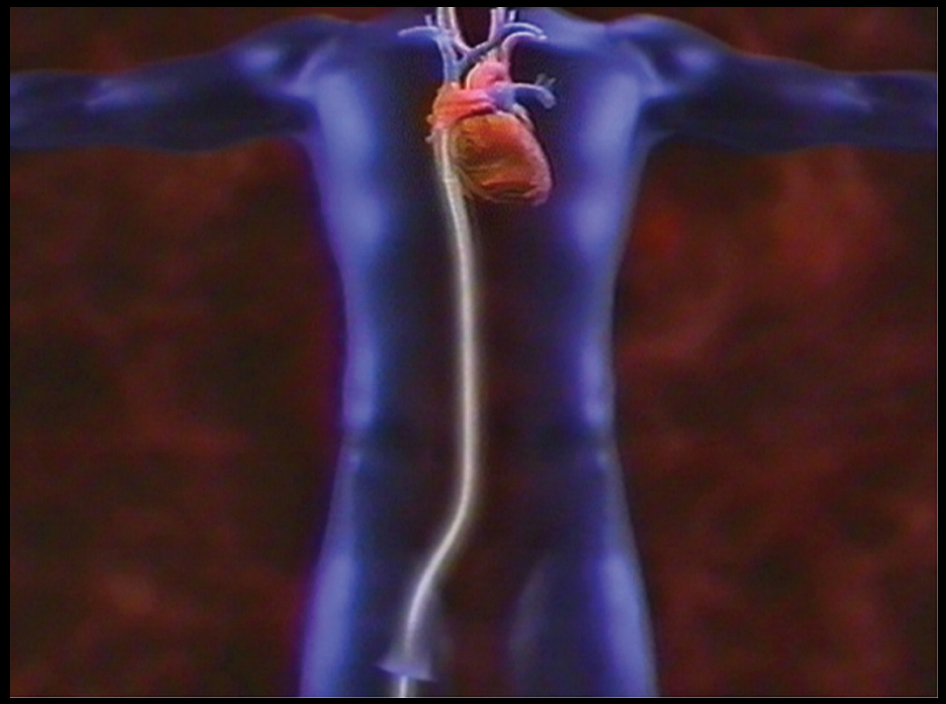
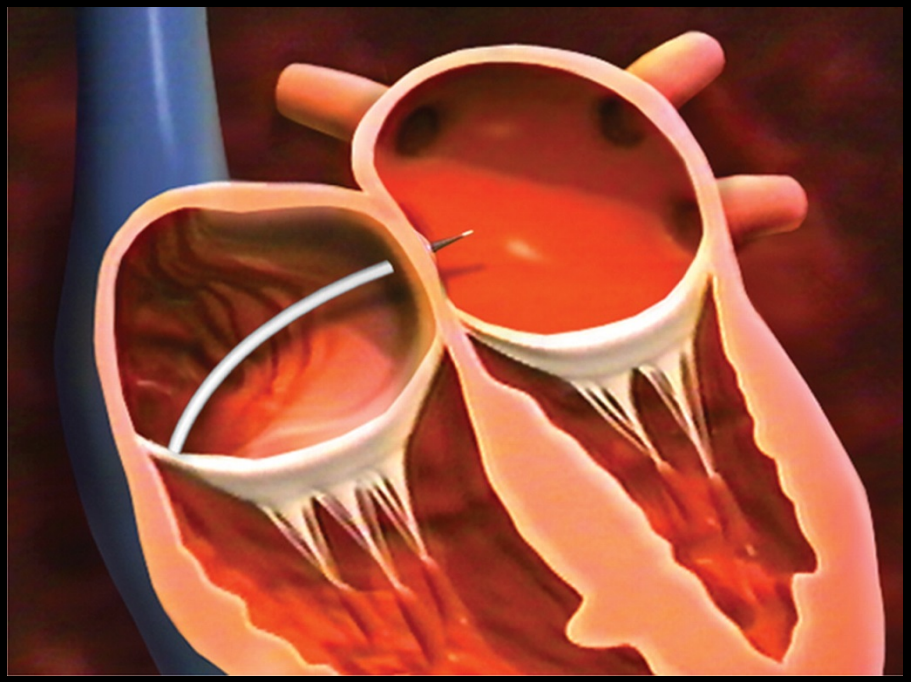
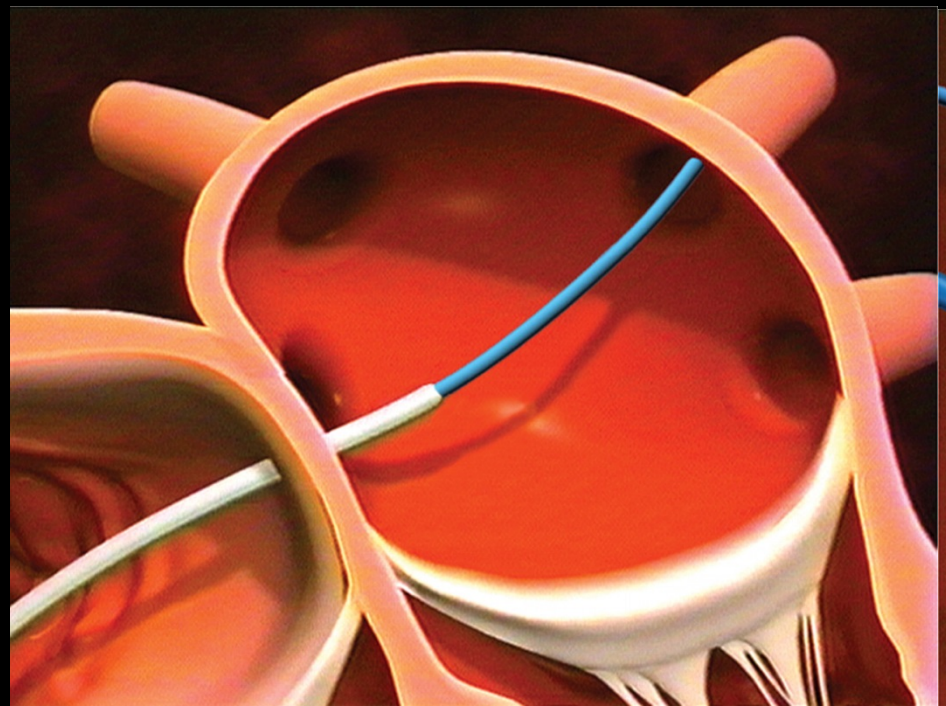
- Evaluation des stents
- Contrôle post-ablation FA
- Bilan d’extension tumeur cardiaque

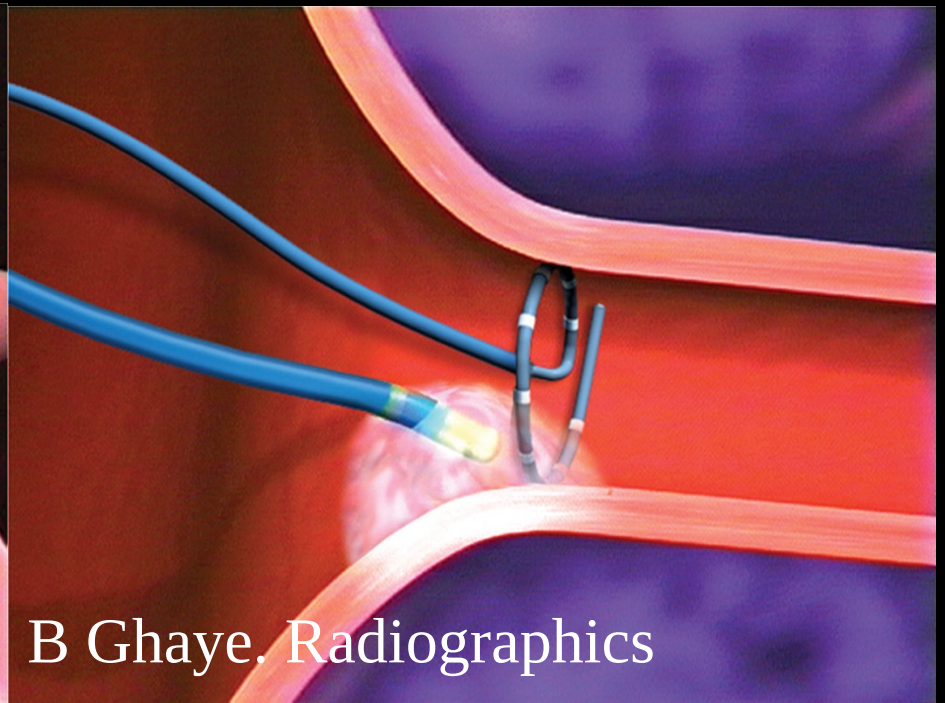
Imagerie des veines pulmonaires

- Traitement percutané des foyers arythmogènes
  - RF :500-1000 KHz
  - Cryoablation
- 4 Veines pulmonaires
  - supérieure gauche et droite
  - Inférieure gauche et droite
- Variations anatomiques
- Possibilité de
    - sténose post traitement: 1.5-42%
    - Thrombose veineuse et infarctus pulmonaire









B Ghaye. Radiographics


:e: 4/1
n: 50/113
x: 146.3
12 x 512
TANDARD
2002 Sep 2(
Acq Tm: 10:16:3
L
20.0 kV
00.0 mA
.5 mm
lt: 0.0
T: 1.1 s
P: 0.8 s
S: 7.50 mm/s

Indications reconnues

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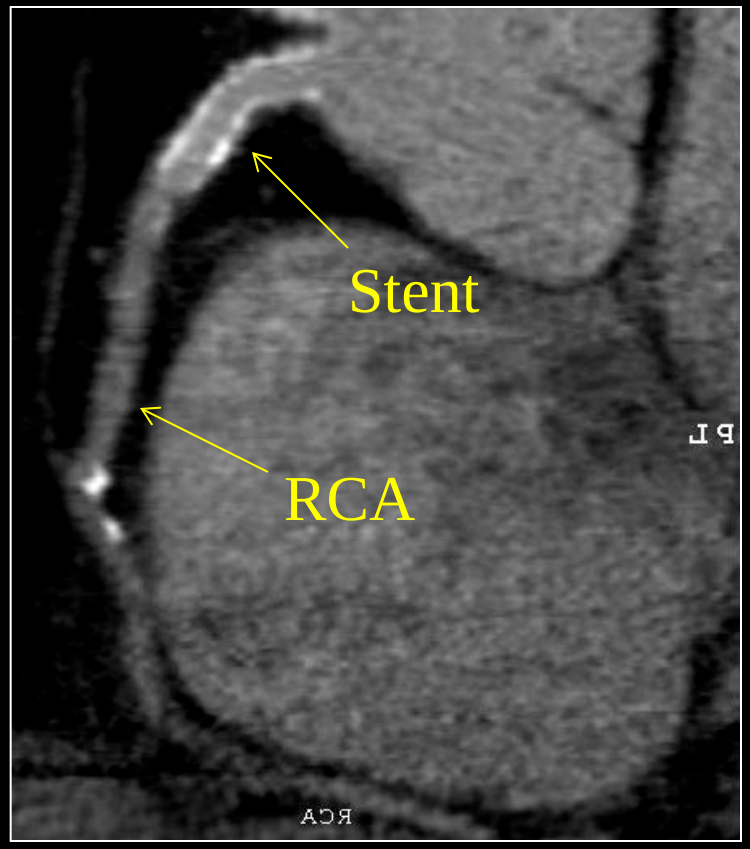
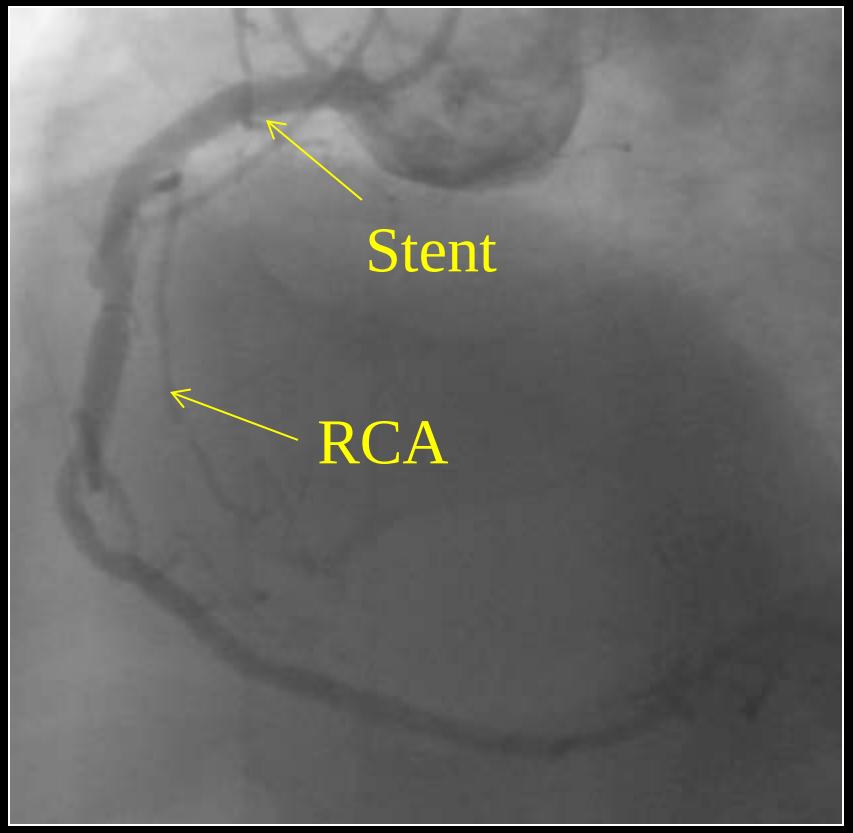
- Bilan d’extension tumeur cardiaque

Stent proximal artère coronaire droite





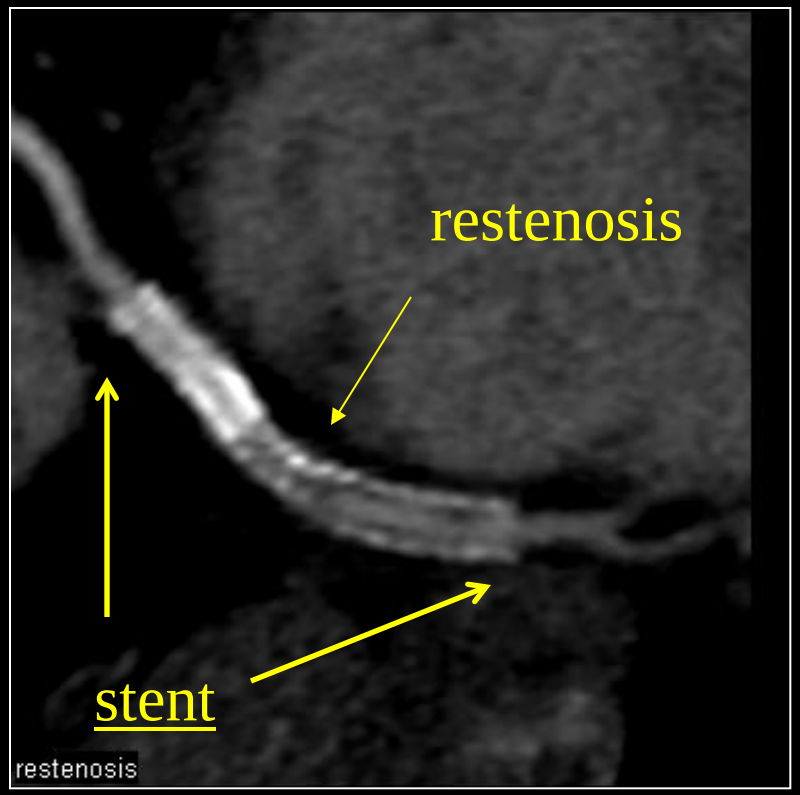
Courtesy Dr. Joëlle Kefer, UCL

European Radiology

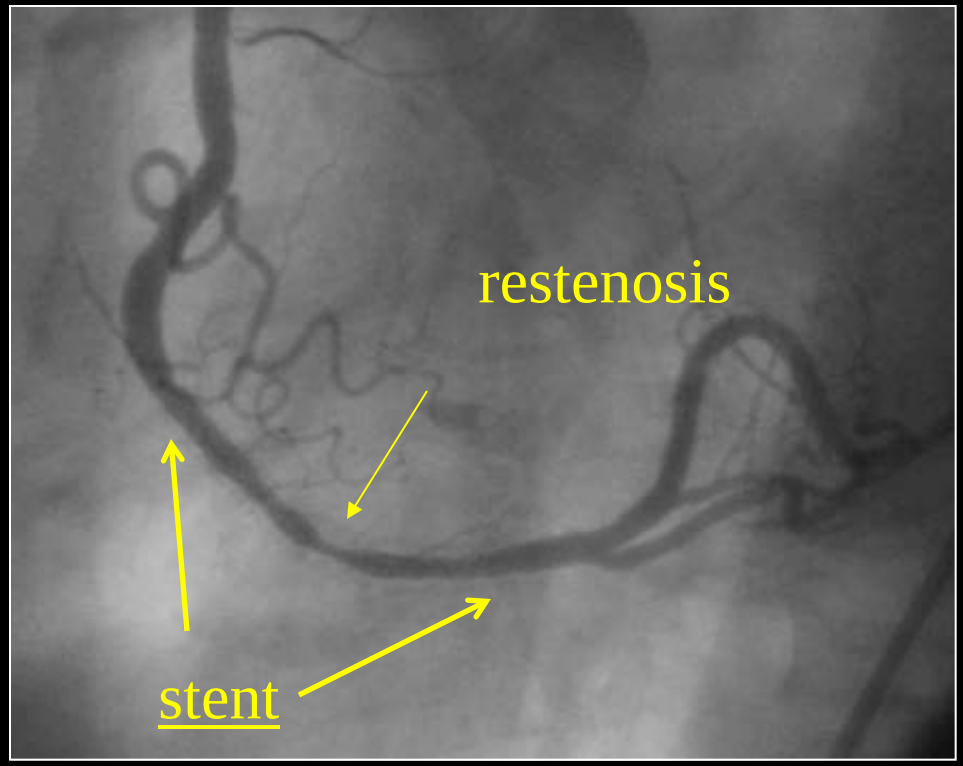
50 patients. Sens. 67%, spéc: 98%, précision diagnostique: 98%

Sténose intra-stent artère coronaire droite

MDCT



Invasive angiography



Courtesy Dr. Joëlle Kefer, UCL

Indications reconnues

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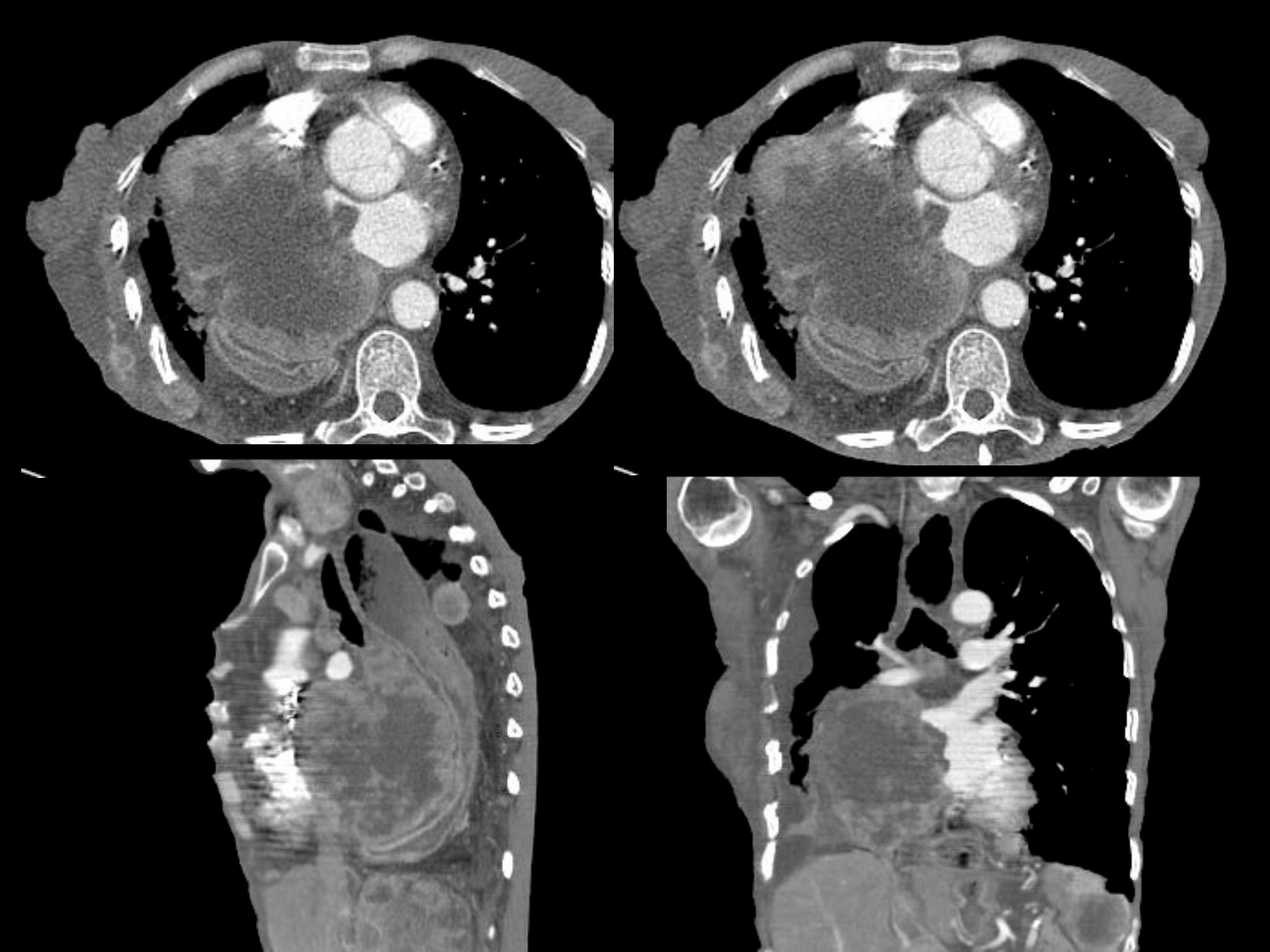
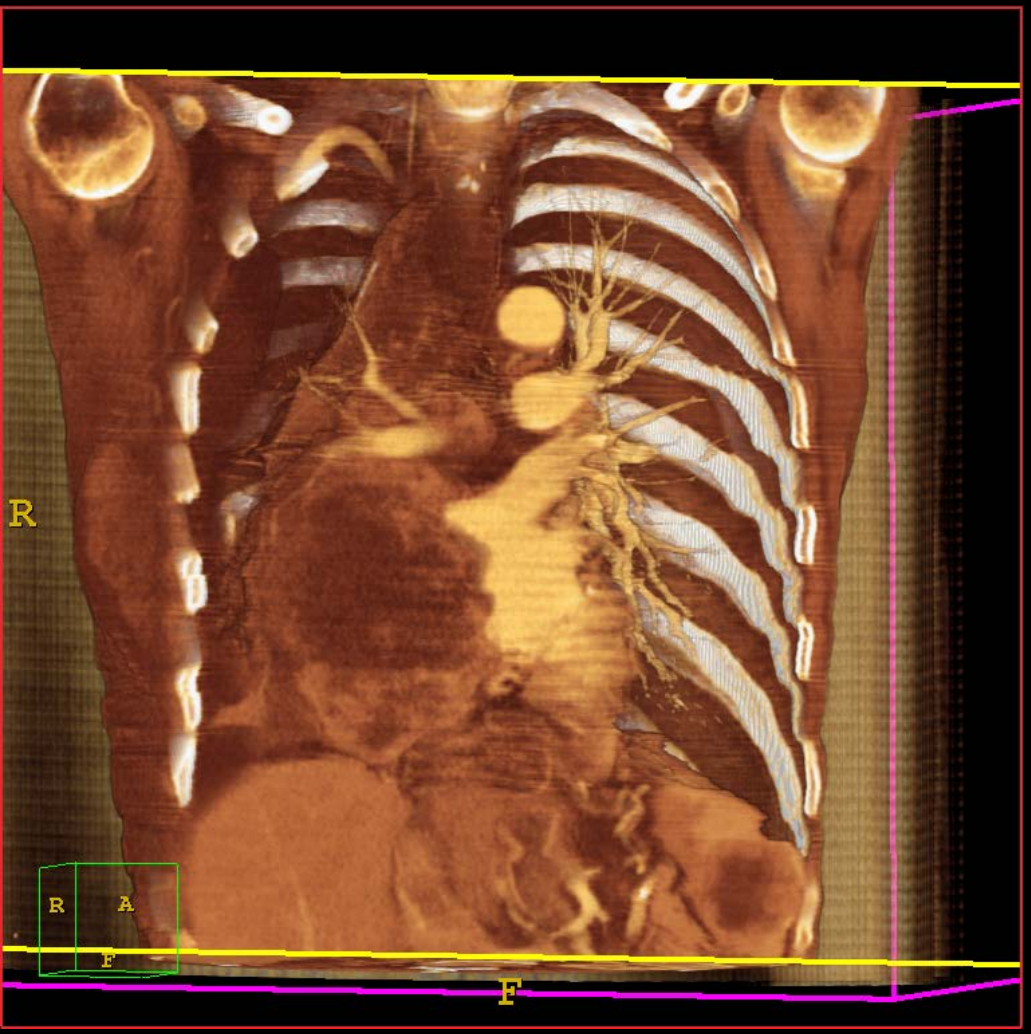
- Evaluation des stents
- Bilan d’extension tumeur cardiaque





Angiosarcome:

-Tumeur a plus fréquente

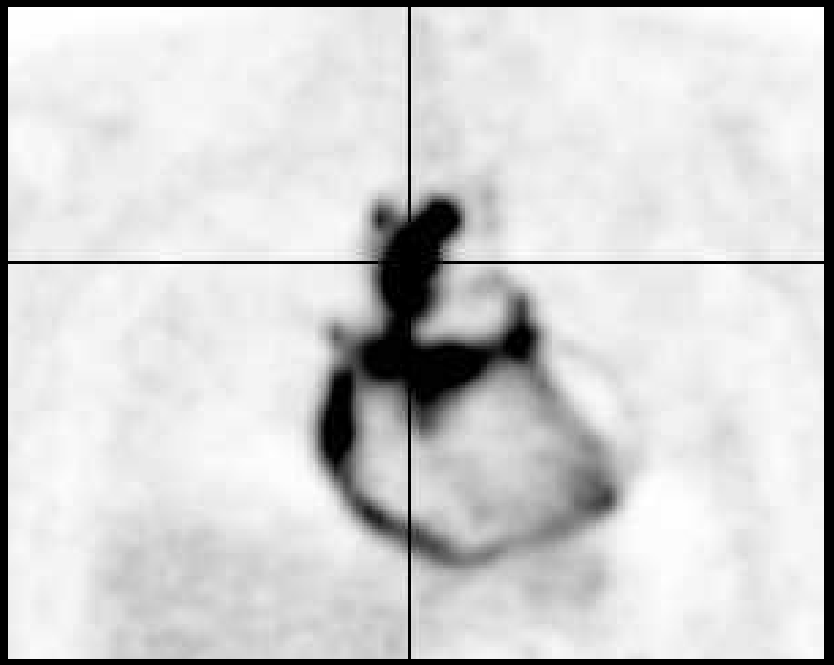
-0.001%-0.3% autopsies

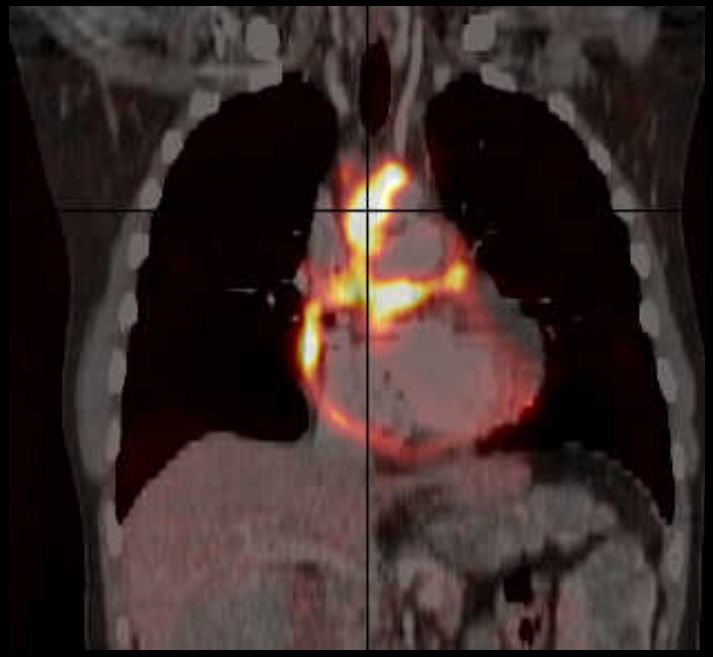
-Tumeur dérivée des cellules endothéliales

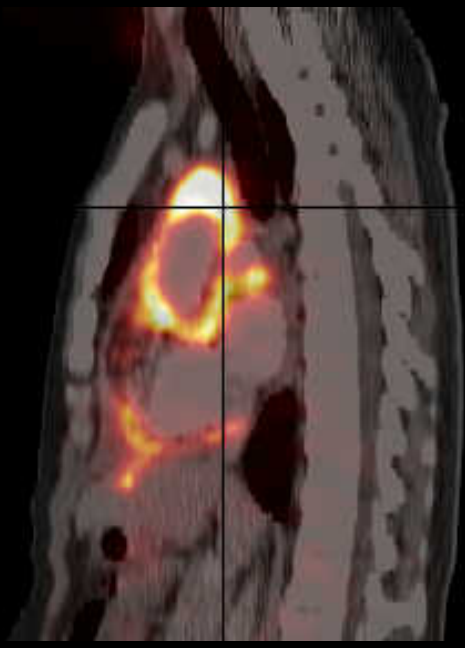
-80% des tumeurs <VD

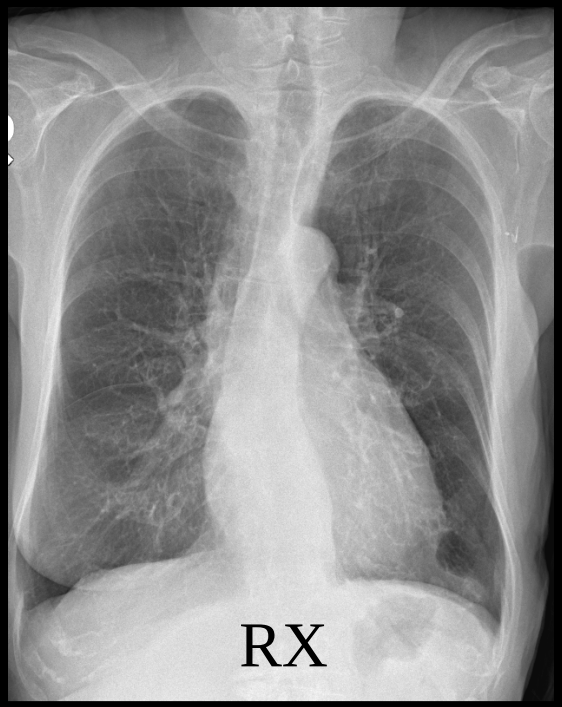
-Traitement: résection chirurgicale mais métastases rapides…..

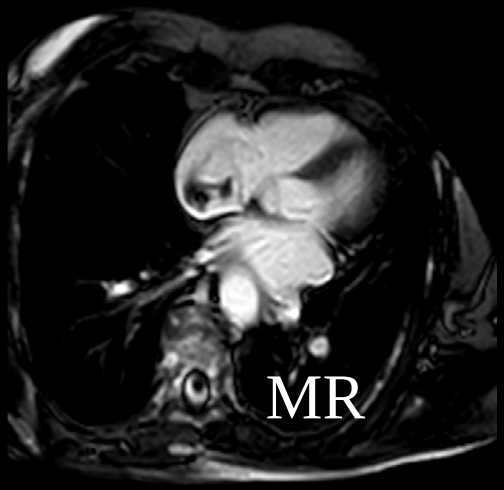
Cardiac Imaging. Radiographics 2003;23:S141-145

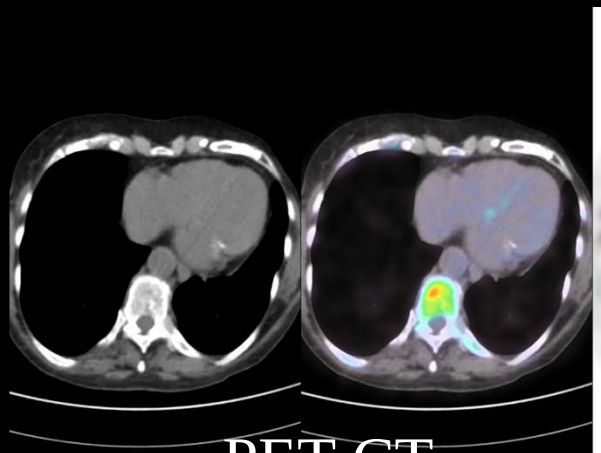


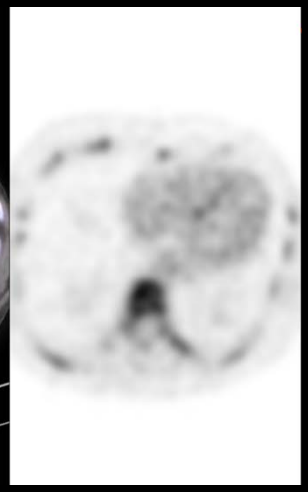










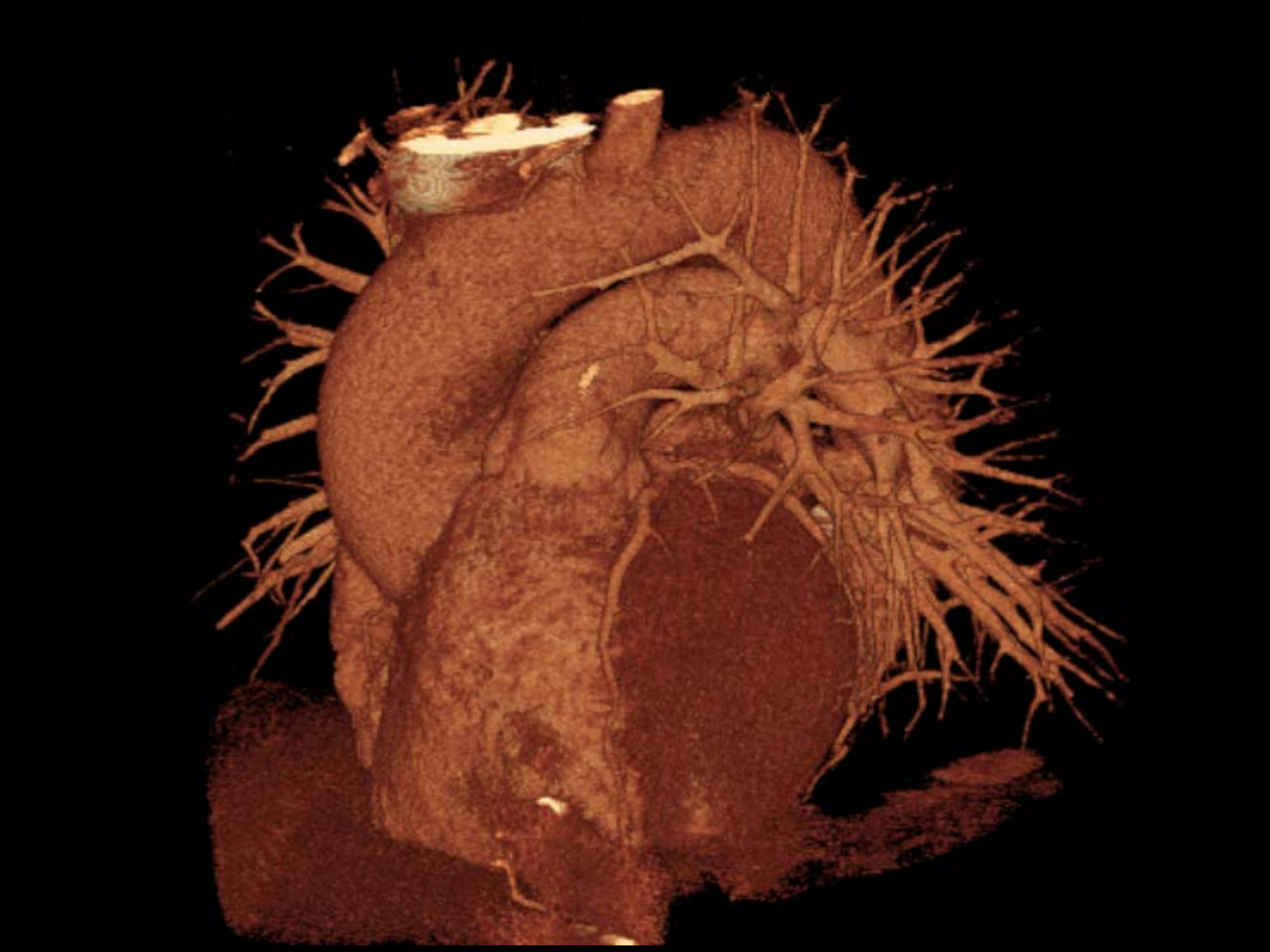


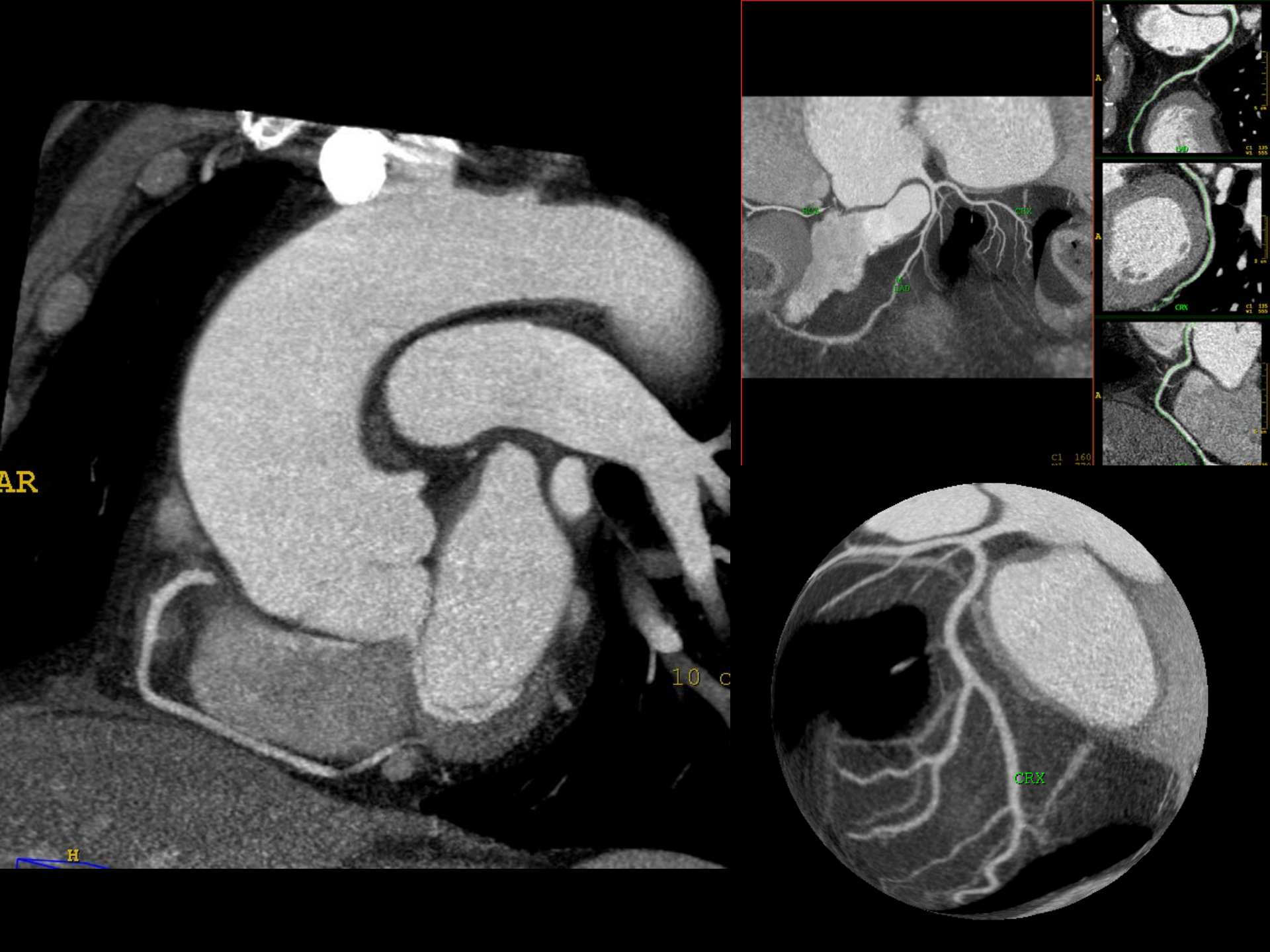
La patiente se présente chez son cardiologue traitant pour contrôle. Elle décrit une fatigue.
Mise en évidence, à l'echo, d'une importante masse mobile dans l'oreillette droite : thrombus vs myxome.

PET-CT: la faible activité métabolique au niveau de la lésion cardiaque connue plaide pour une origine bénigne (myxome ?, thrombus ?, fibrome ?, ...). Métabolisme médullaire majoré et hétérogène méritant d'être mis au point et annexe gauche hypermétabolique suspecte: cfr bilan gynéco/gastro.

Indications en cours d'évaluation

- Imagerie intégrée aorte + coronaires (pré-op)
- Caractérisation plaque d'athérome
- Imagerie des valves
- Etude de la viabilité myocardique
- Etude de la fonction cardiaque
- Bilan de douleurs thoraciques atypiques en salle d'urgence




AR
10 c
H
RCA
CRX
LAD
CRX

Indications en cours d'évaluation

- Imagerie intégrée aorte + coronaires (pré-op)
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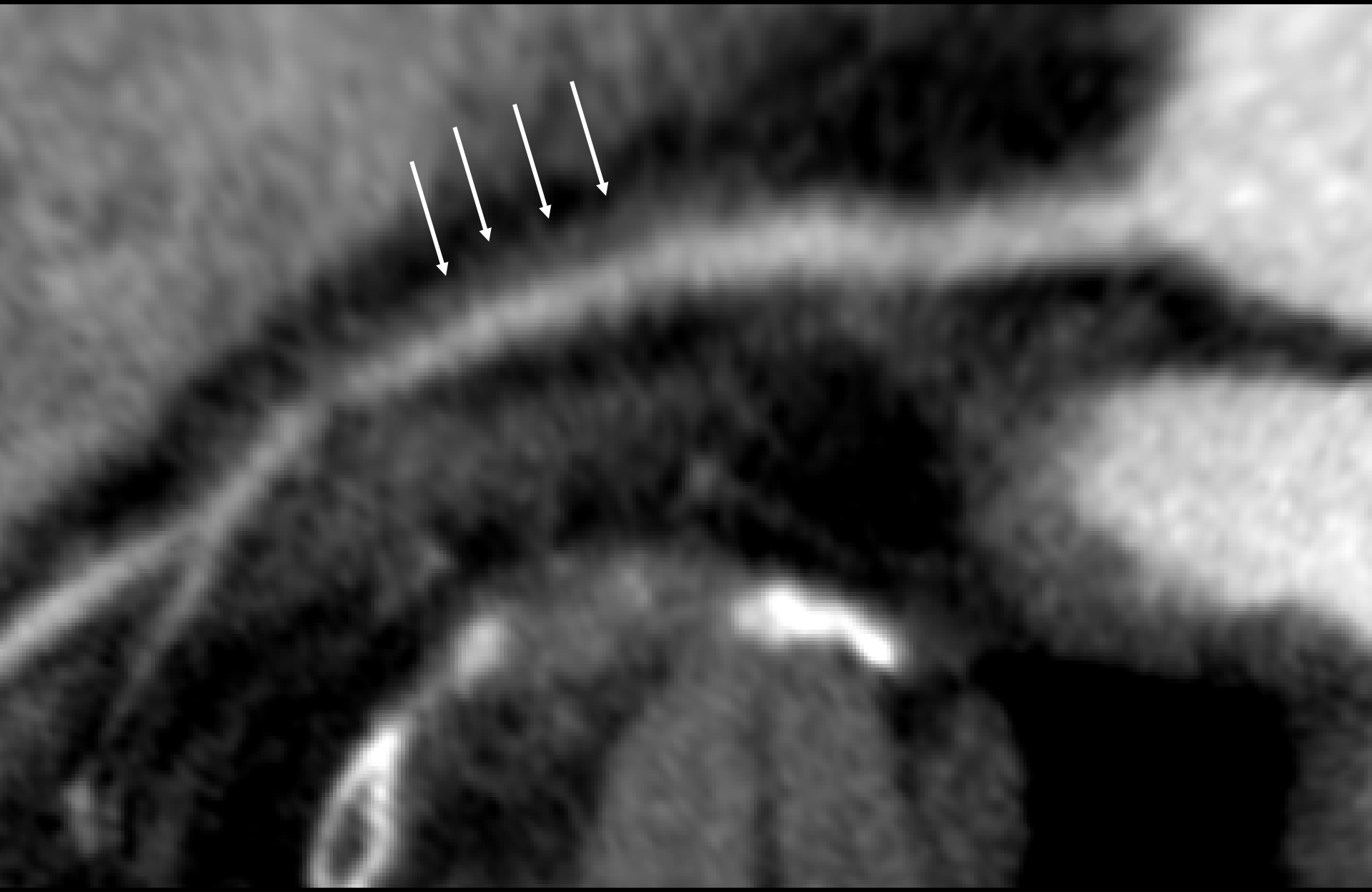
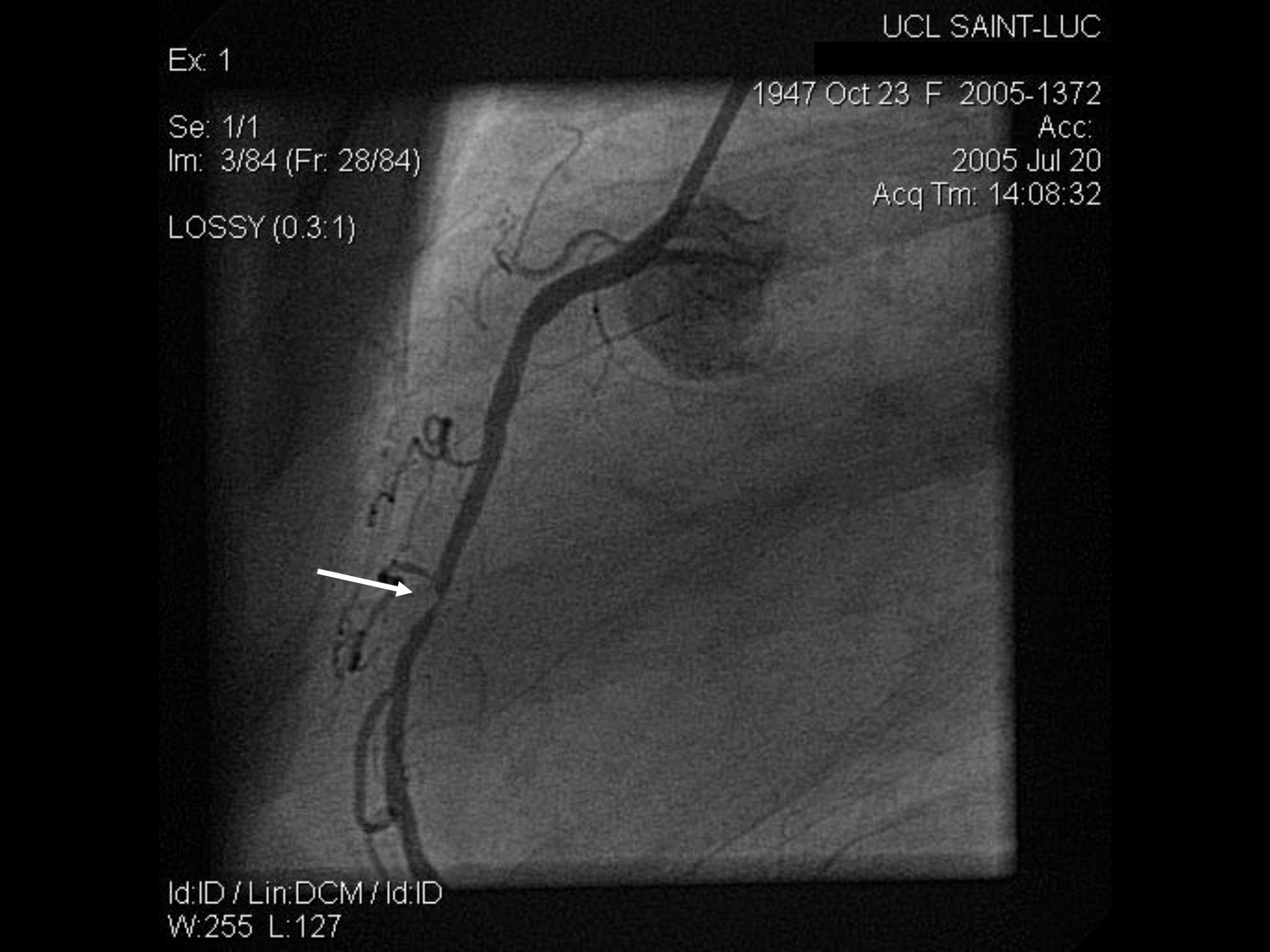
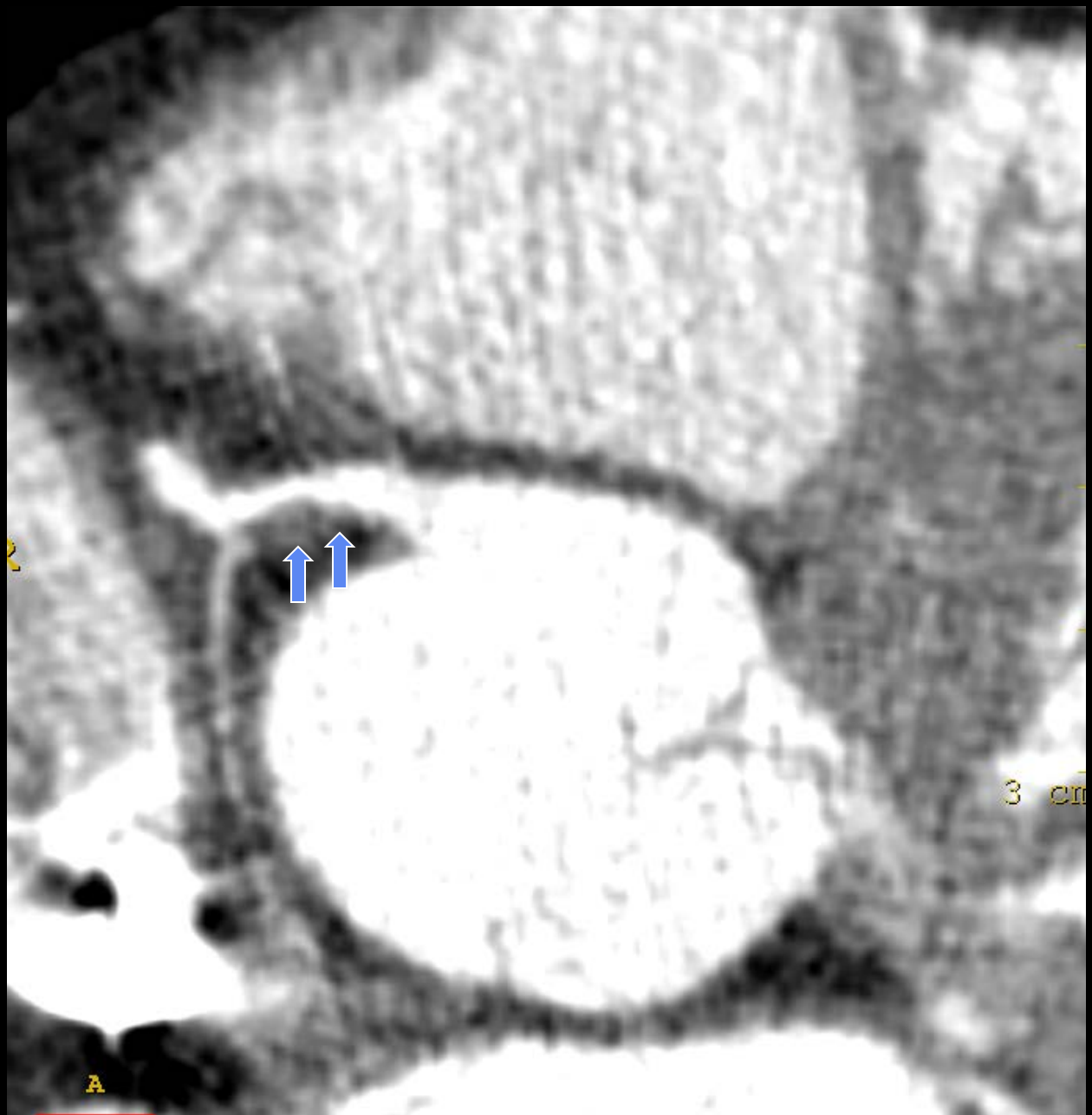
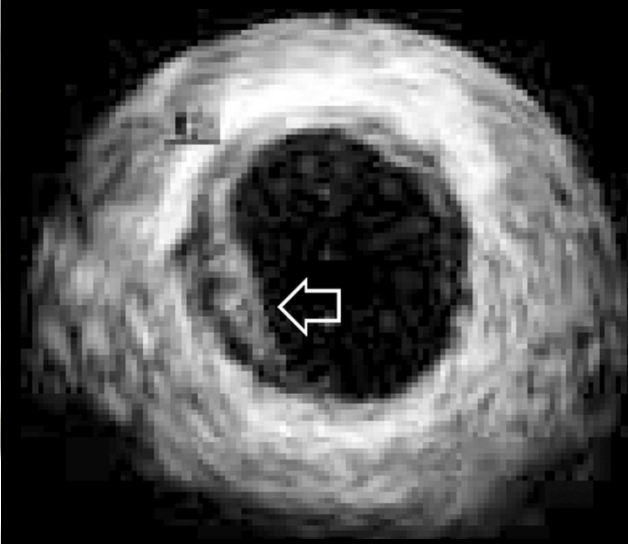



UCL SAINT-LUC
Ex: 1
1947 Oct 23 F 2005-1372
Se: 1/1
Acc:
Im: 3/84 (Fr: 28/84)
2005 Jul 20
Acq Tm: 14:08:32
LOSSY (0.3:1)
Id:ID / Lin:DCM / Id:ID
W:255 L:127

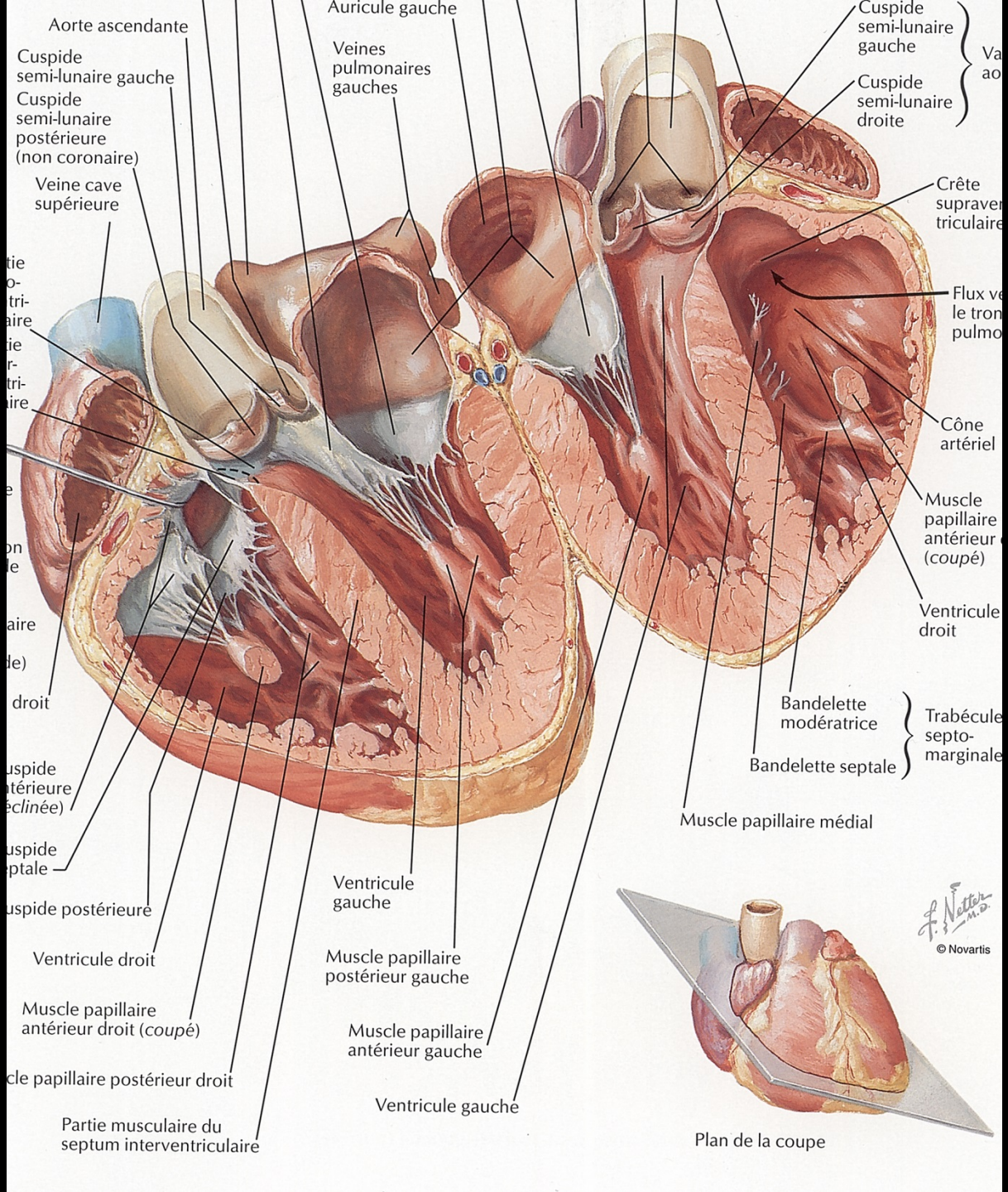
Caractérisation de la plaque

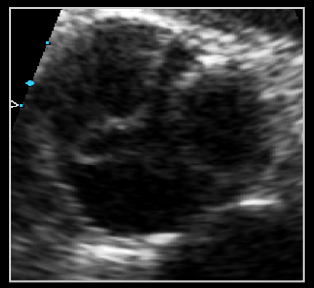
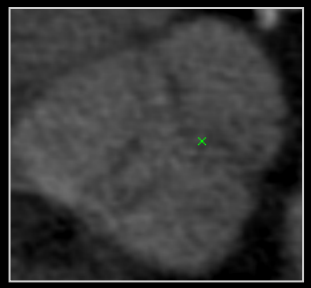
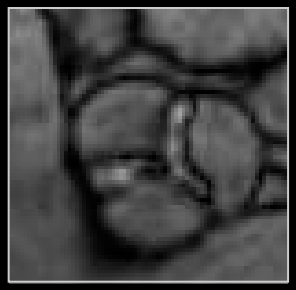
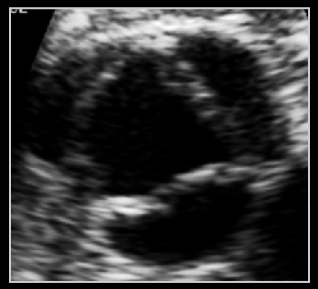
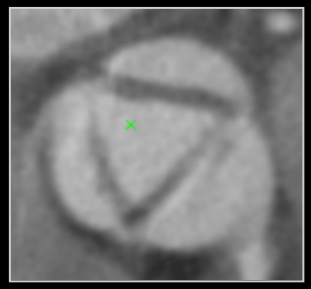
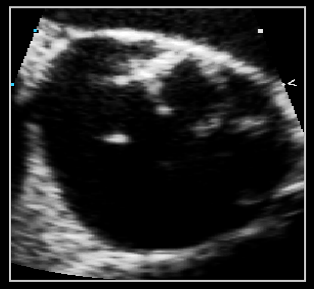
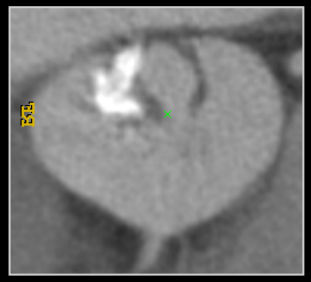
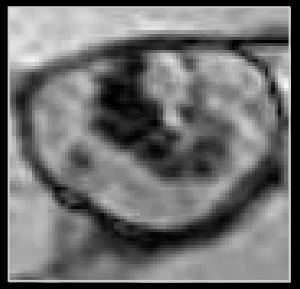
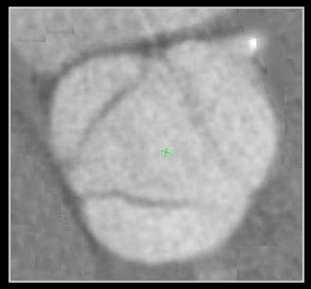
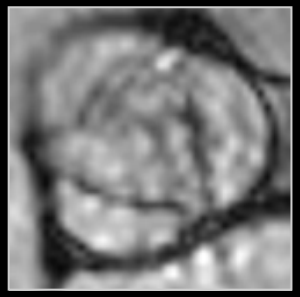




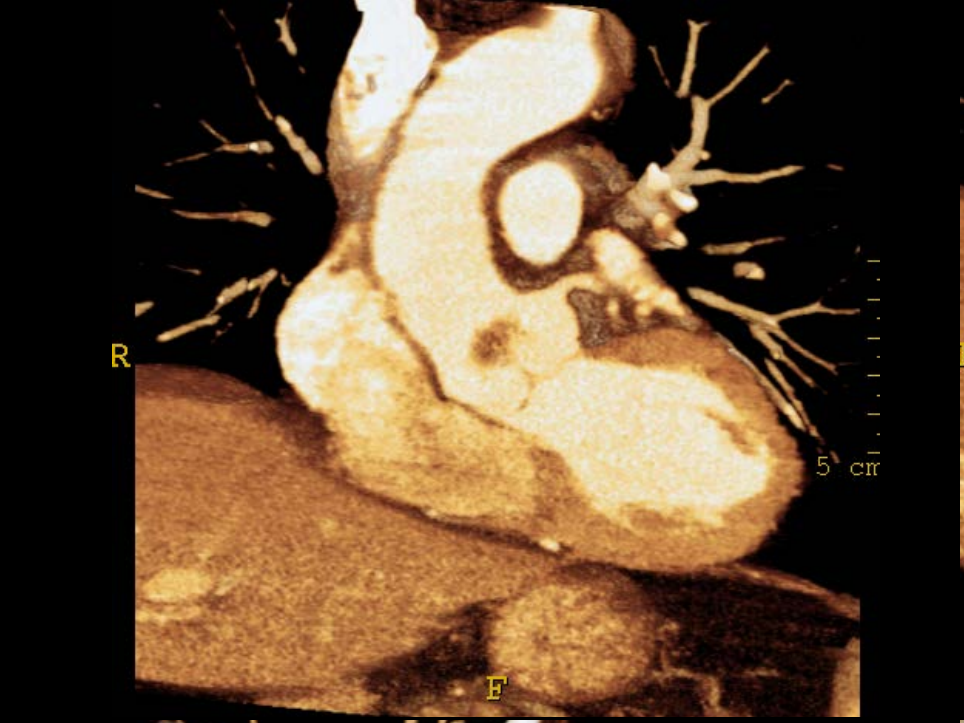
Indications en cours d'évaluation

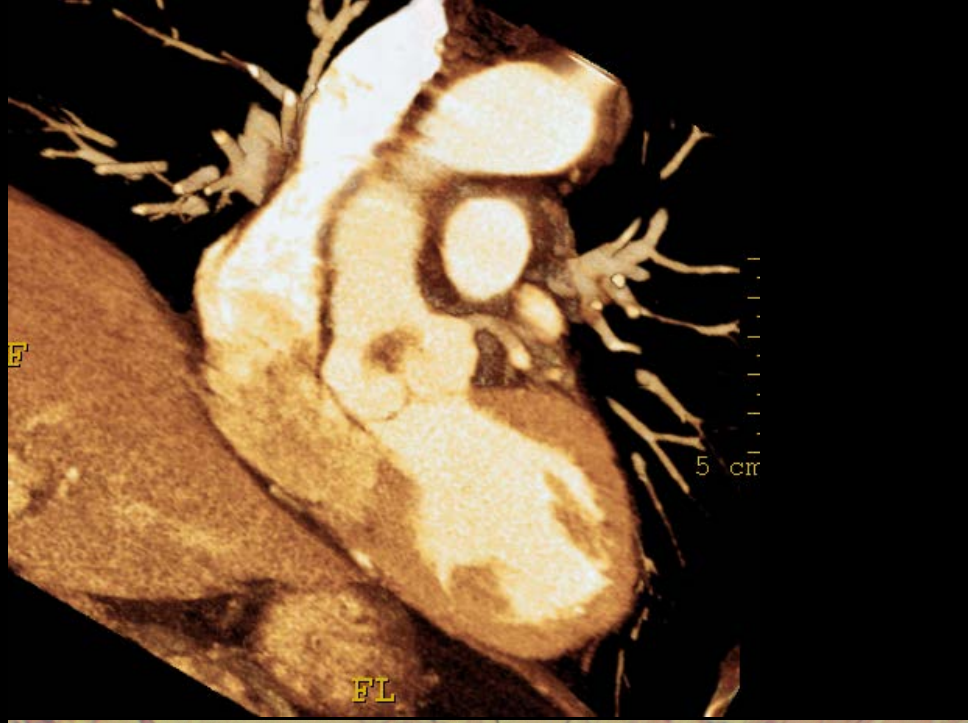
- Imagerie intégrée aorte + coronaires (pré-op)
- Caractérisation plaque d'athérome
- Imagerie des valves
- Etude de la viabilité myocardique
- Etude de la fonction cardiaque
- Bilan de douleurs thoraciques atypiques en salle d'urgence


Aorte ascendante
Cuspide semi-lunaire gauche
Cuspide semi-lunaire postérieure (non coronaire)
Veine cave supérieure
Auricule gauche
Veines pulmonaires gauches
Cuspide semi-lunaire gauche
Cuspide semi-lunaire droite
Crête supraventriculaire
Flux ventriculaire vers le tronc pulmonaire
Cône artériel
Muscle papillaire antérieur (coupé)
Ventricule droit
Bandelette modératrice
Bandelette septale
Trabécule septo-marginale
Muscle papillaire médial
droit
Ventricule gauche
Ventricule droit
Muscle papillaire postérieur gauche
Muscle papillaire antérieur droit (coupé)
Muscle papillaire antérieur gauche
Ventricule gauche
Partie musculaire du septum interventriculaire
F. H. Netter M.D.
© Novartis
Plan de la coupe

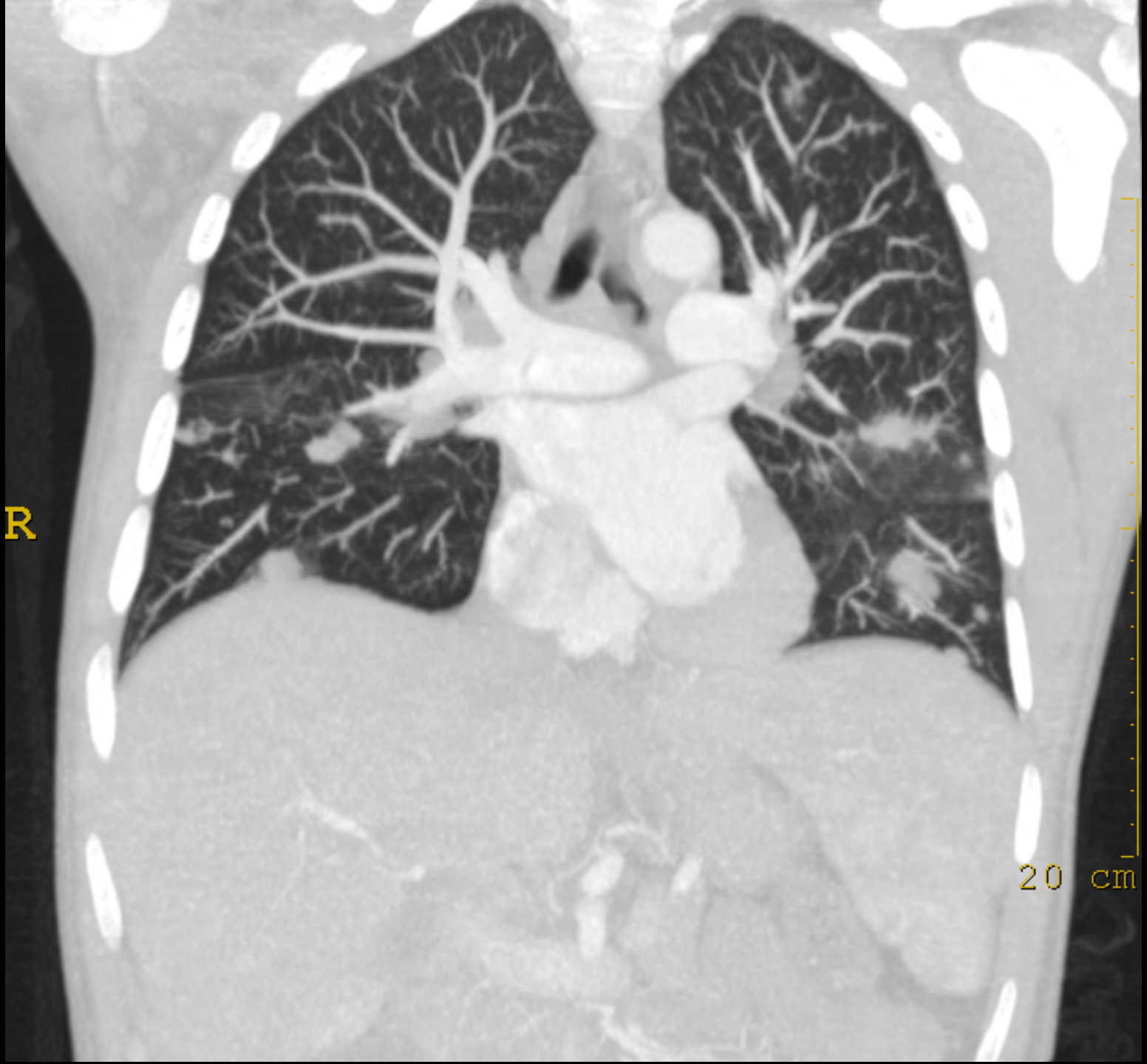
TEE	MDCT	MRI	Aortic valve
			Stenotic tricuspid
			Mild stenotic tricuspid
			Stenotic bicuspid
			Normal tricuspid

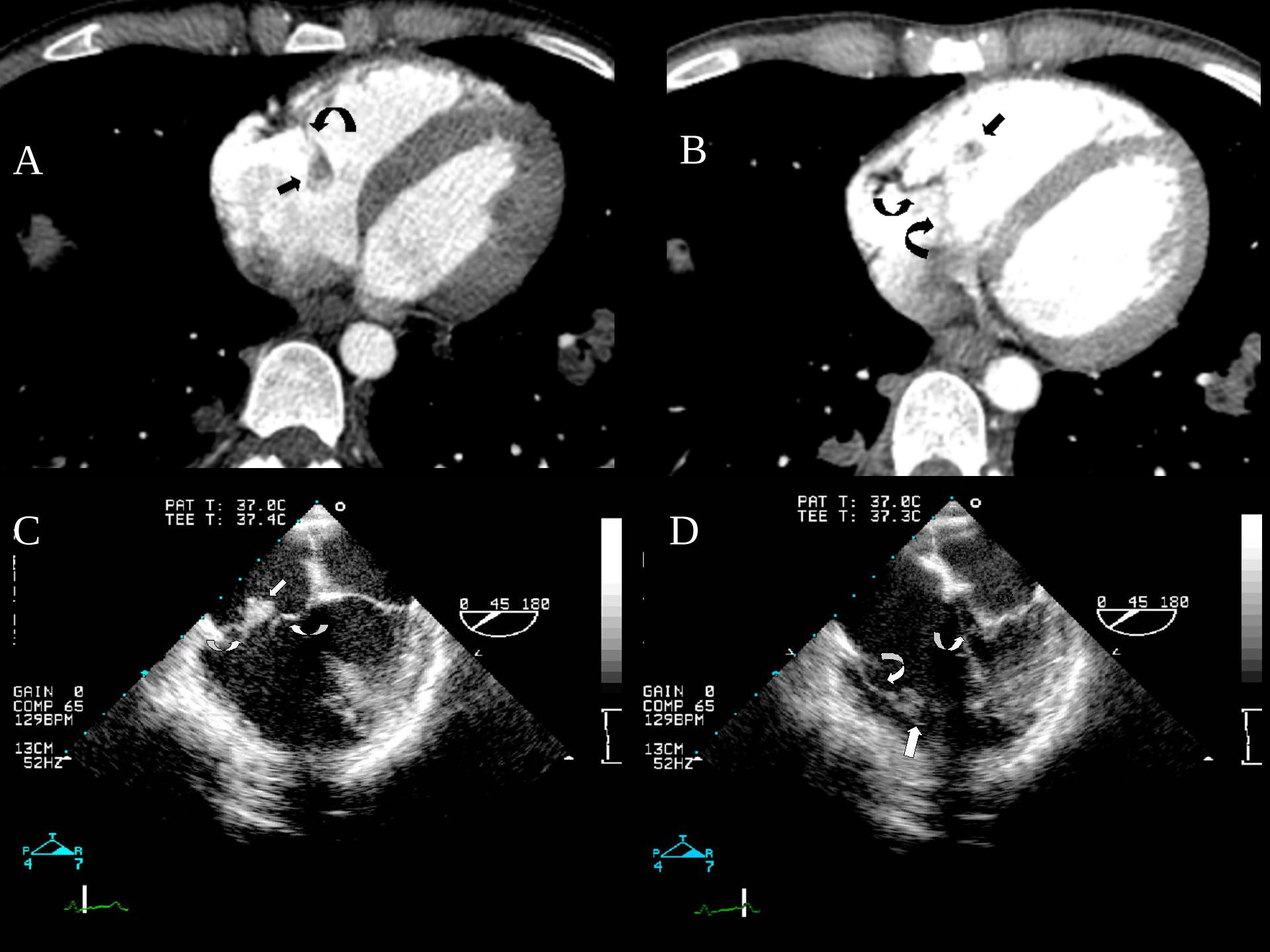
JACC

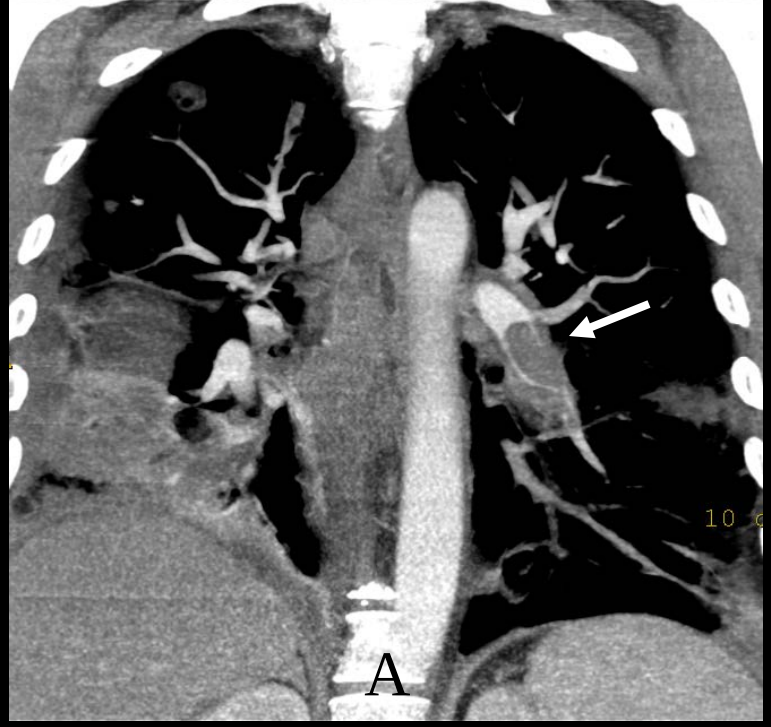

R
5 cm
F

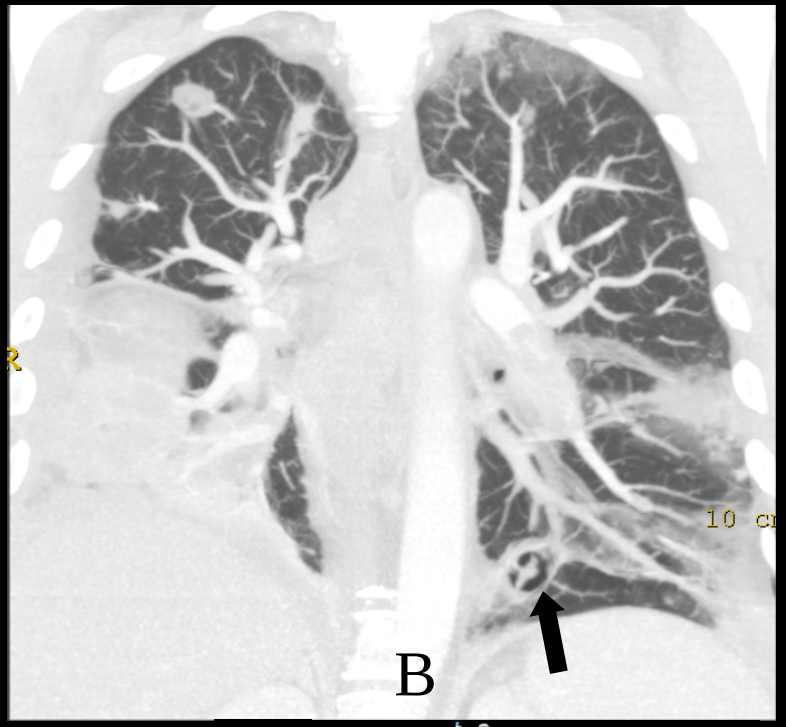

F
5 cm
FL


5 cm
FL


R
20 cm


A
B
C
PAT T: 37.0C
TEE T: 37.4C
0 45 180
GAIN 0
COMP 65
129BPM
13CM
52HZ
D
PAT T: 37.0C
TEE T: 37.3C
0 45 180
GAIN 0
COMP 65
129BPM
13CM
52HZ


A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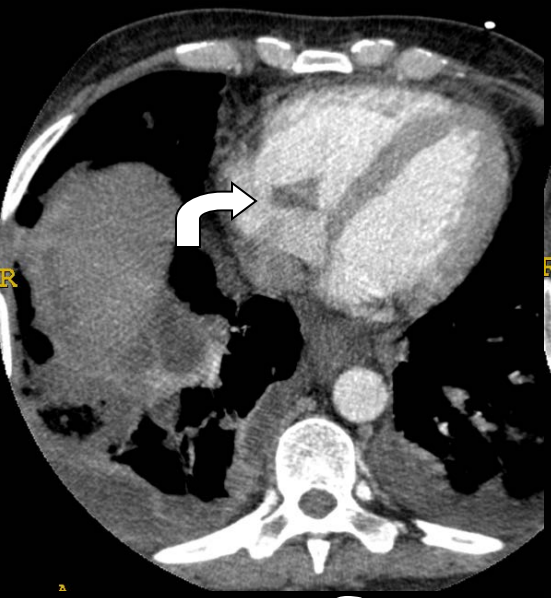
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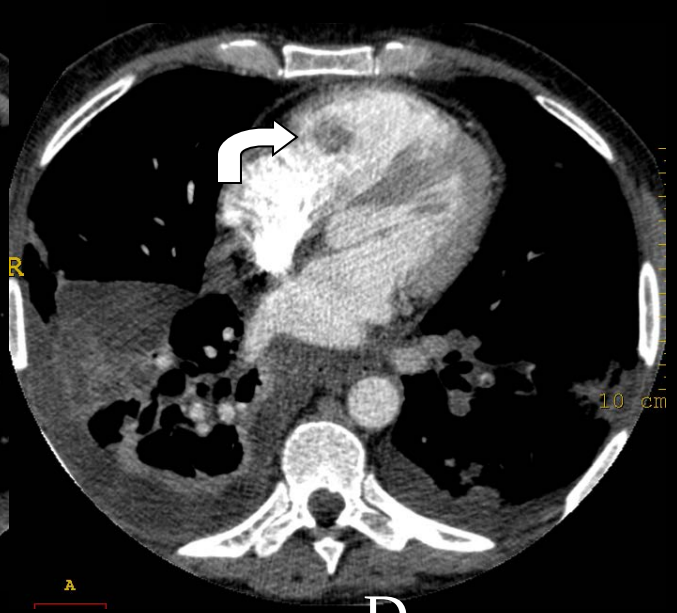
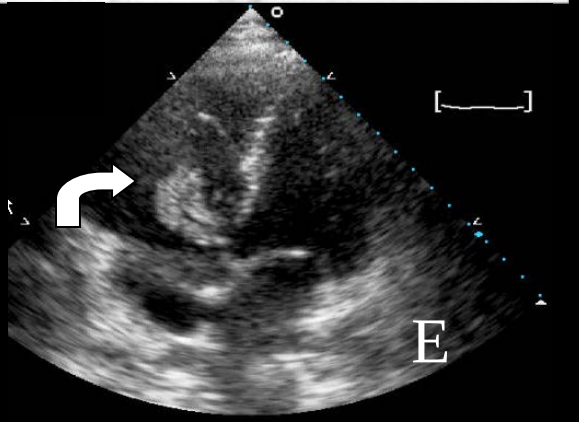

D


E


F

Indications en cours d'évaluation

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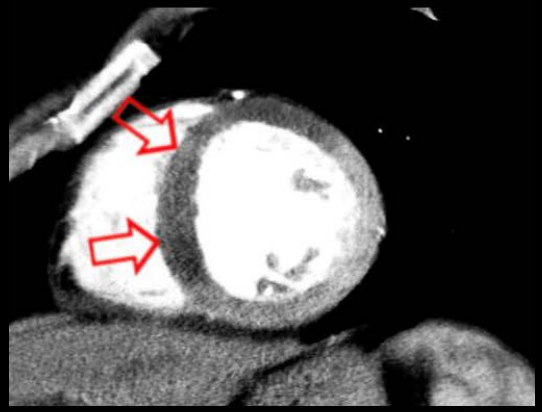
- Bilan de douleurs thoraciques atypiques en salle d'urgence

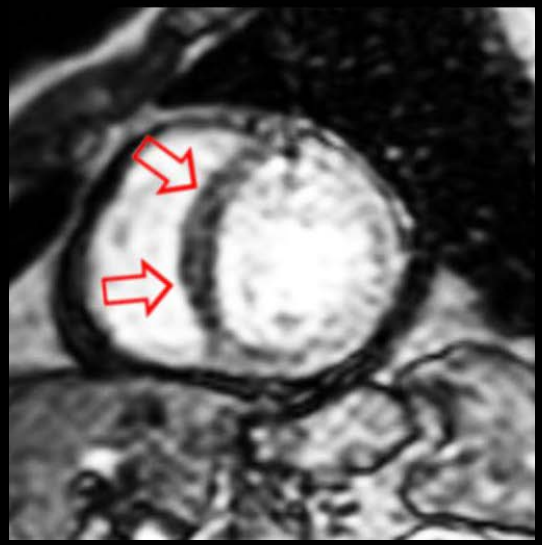
Images précoces

Gerber et al. Circulation 2006; 113:823-33

CT



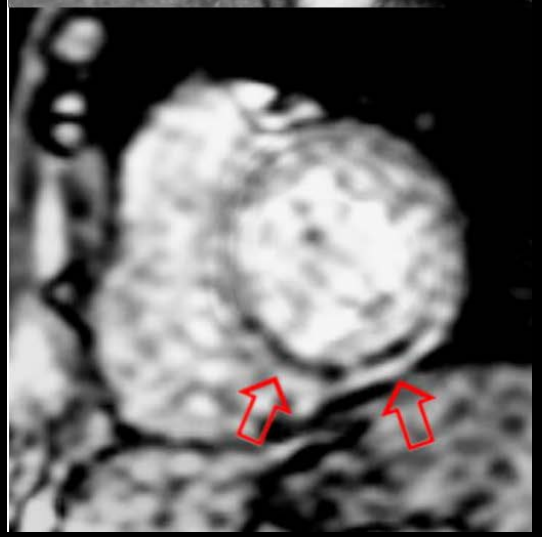
MR



Infarctus aigu: 10 jrs

CT

MR



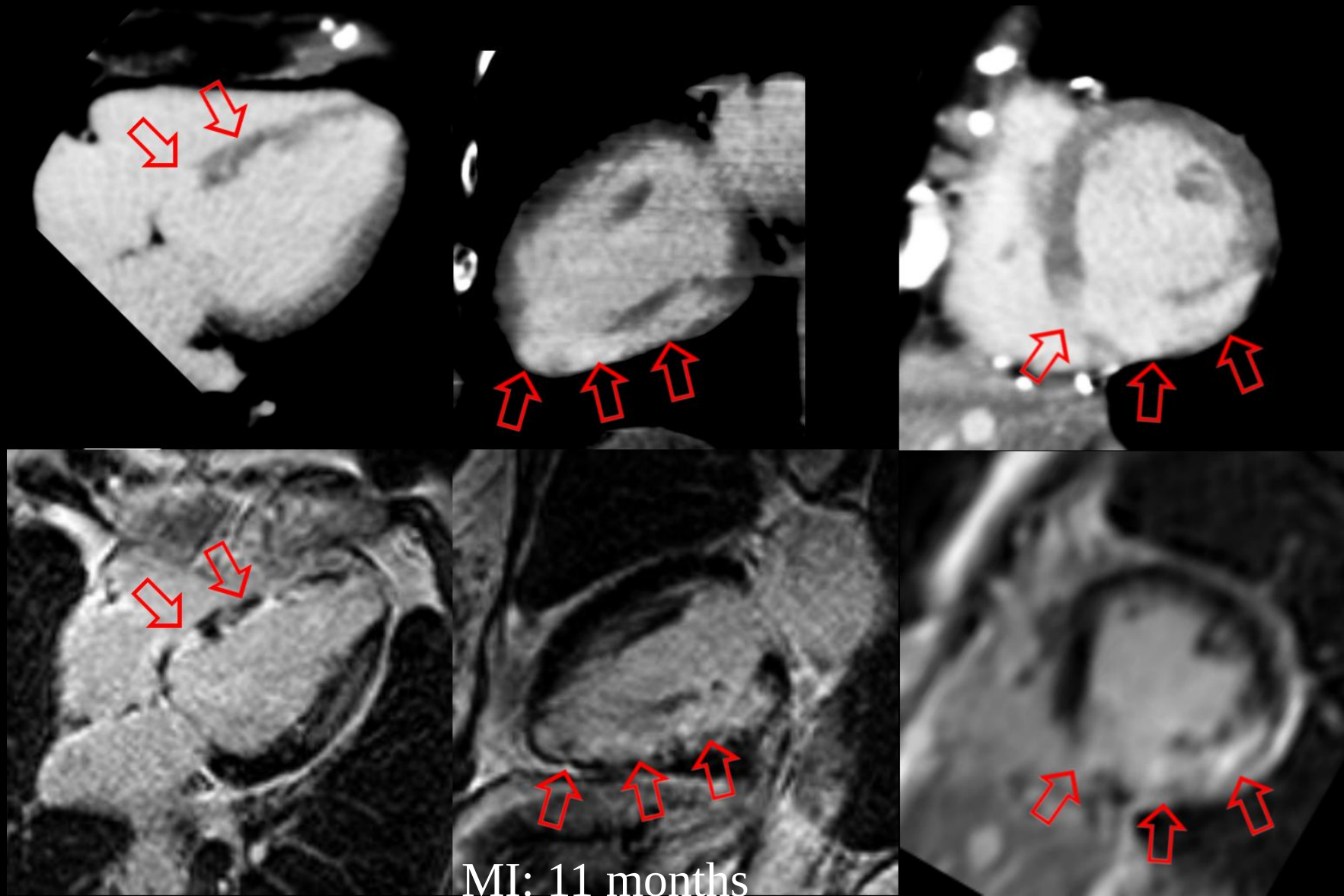
Infarctus aigu: 2 jours

Exemples Images tardives

Gerber et al. Circulation 2006; 113:823-33

CT

MR



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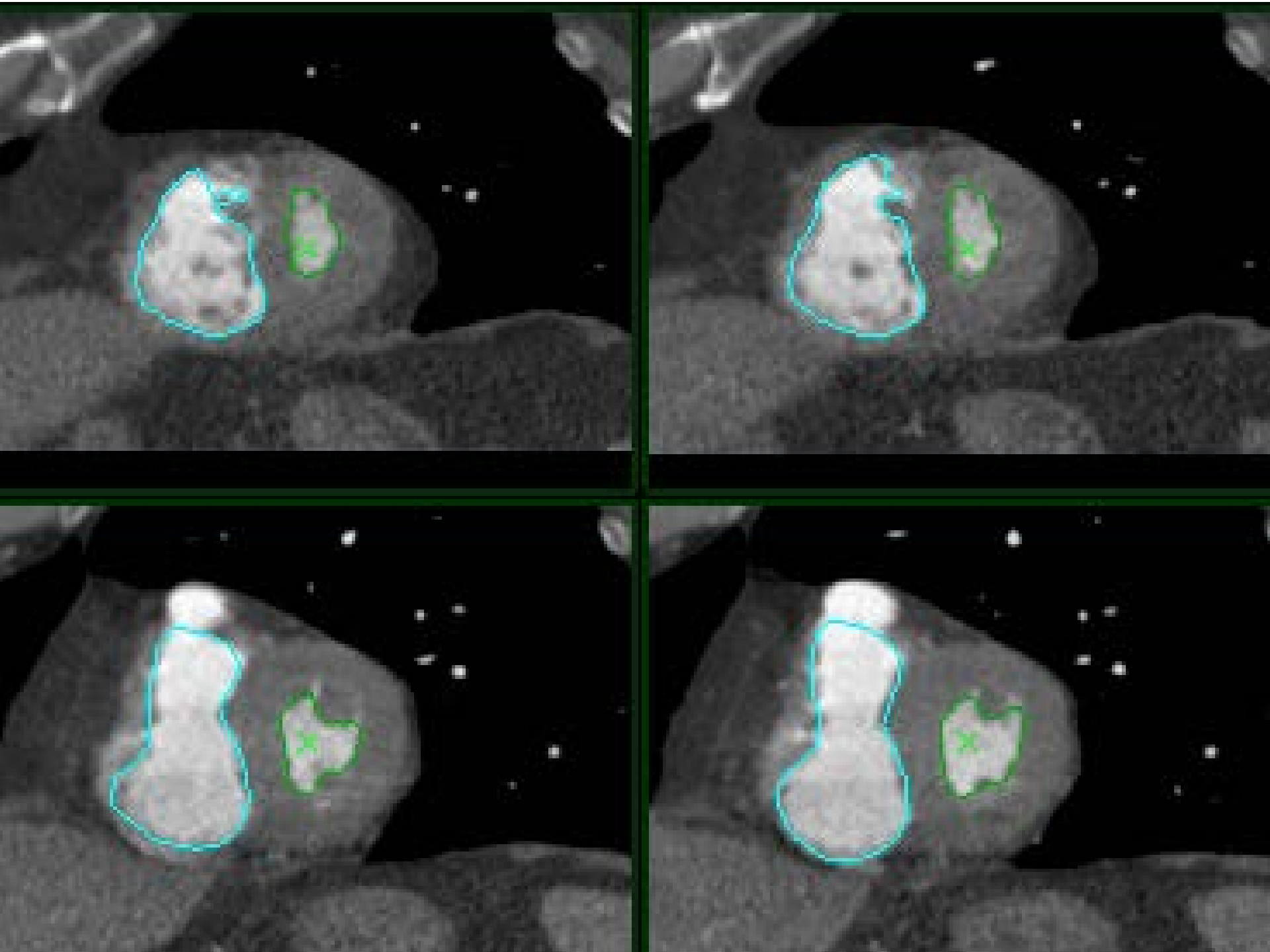
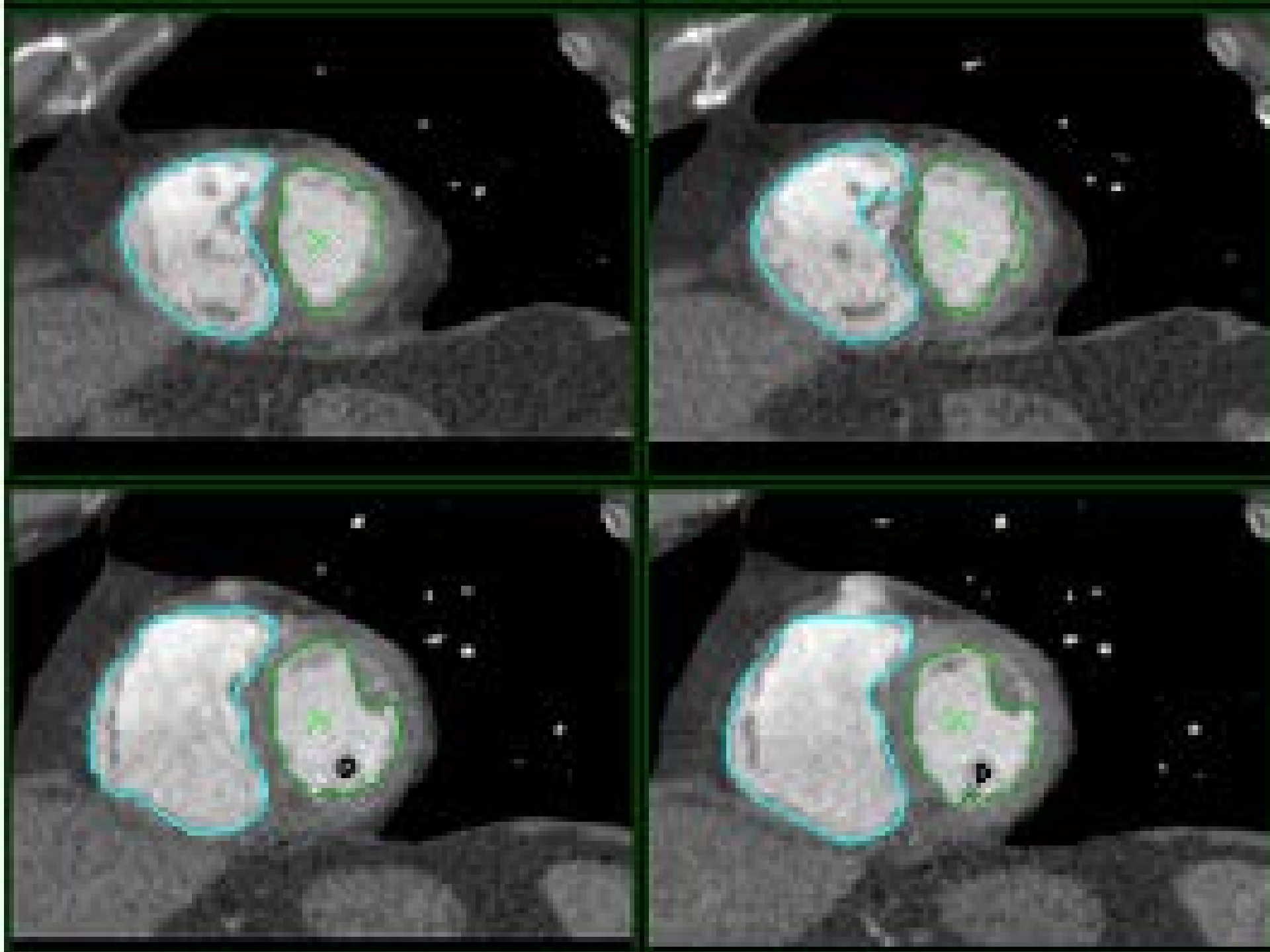
Fonction cardiaque

- Reconstruction des volumes en systole et télédiastole
- Mesurer ainsi la fraction d'éjection, épaisseur myocardique, fonction régionale
- Résultats préliminaires montrent une bonne corrélation avec les mesures effectuées en IRM





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These trials have demonstrated that a first approach with cardiac CT for patients at low and intermediate risk presenting to the ED with chest pain appears to be a safe and viable alternative to functional testing.
Negative troponin/Non ischemic ECG/ Low-intermediate risk

Douleurs thoraciques en salle d'urgences

Exclure en 1 acquisition

1. Embolie pulmonaire
2. Dissection aortique
3. Syndrome coronarien aigu

CT cardiaque en salle d'urgence

EMERGENCY RADIOLOGY SPECIAL FEATURE: REVIEW ARTICLE

Chest pain: coronary CT in the ER

[1]ERICA MAFFEI, MD, [2]SARA SEITUN, MD, [3]ANDREA I GUARICCI, MD and [1,4]FILIPPO CADEMARTIRI, MD, PhD

[1]Centre de Recherché/Department of Radiology, Montréal Heart Institute/Université de Montréal, Montréal, Quebec, Canada
[2]Department of Radiology, IRCCS San Martino University Hospital—IST, Genoa, Italy
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ABSTRACT

Cardiac CT has developed into a robust clinical tool during the past 15 years. Of the fields in which the potential of cardiac CT has raised more interest is chest pain in acute settings. In fact, the possibility to exclude with high reliability obstructive coronary artery disease (CAD) in patients at low-to-intermediate risk is of great interest both from the clinical standpoint and from the management standpoint. Several other modalities, with or without imaging, have been used during the past decades in the settings of new onset chest pain or in acute chest pain for both diagnostic and prognostic assessment of CAD. Each one has advantages and disadvantages. Most imaging modalities also focus on inducible ischaemia to guide referral to invasive coronary angiography. The advent of cardiac CT has introduced a new practice diagnostic paradigm, being the most accurate non-invasive method for identification and exclusion of CAD. Furthermore, the detection of subclinical CAD and plaque imaging offer the opportunity to improve risk stratification. Moreover, recent advances of the latest generation CT scanners allow combining both anatomical and functional imaging by stress myocardial perfusion. The role of cardiac CT in acute settings is already important and will become progressively more important in the coming years.

Invited Review

Coronary CT angiography for acute chest pain in the emergency department

Henrique Lane Staniak MD, PhD[a], Marcio Sommer Bittencourt MD, PhD[a], Christopher Pickett MD[b,c], Michael Cahill MD[b,c], David Kassop MD[b,c], Ahmad Slim MD[d], Ron Blankstein MD[e,f], Edward Hulten MD, MPH[b,c,]*

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[d] *Cardiology Service MCHE-MDC, San Antonio Military Medical Center, Brooke Army Medical Center, San Antonio, TX, USA*
[e] *Noninvasive Cardiovascular Imaging Program, Cardiovascular Division, Department of Medicine, Brigham and Women's Hospital, Boston, MA, USA*
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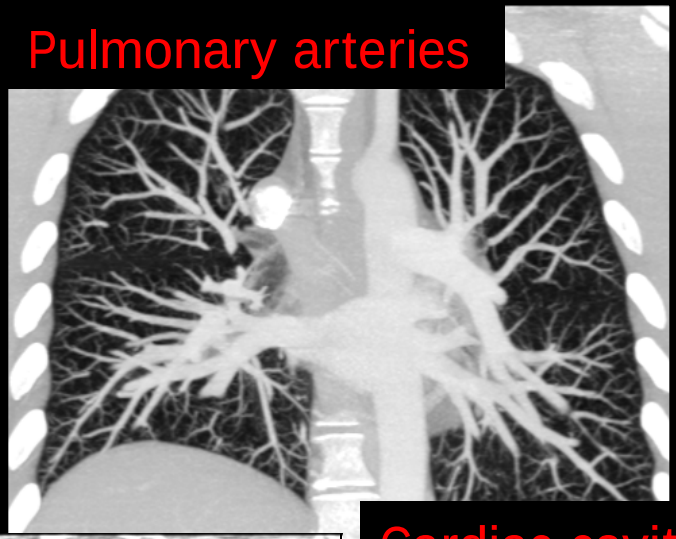
ABSTRACT

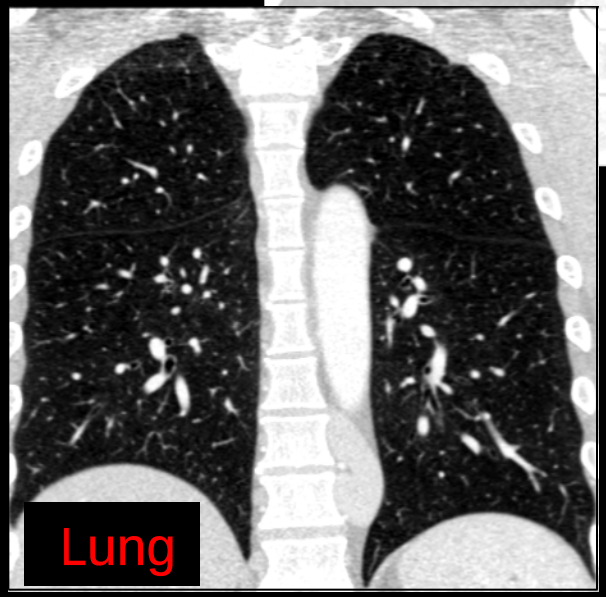
Acute chest pain in the emergency department (ED) is a common and costly public health challenge. The traditional strategy of evaluating acute chest pain by hospital or ED observation over a period of several hours, serial electrocardiography and cardiac biomarkers, and subsequent diagnostic testing such as physiologic stress testing is safe and effective. Yet this approach has been criticized for being time intensive and costly. This review evaluates the current medical evidence which has demonstrated the potential for coronary CT angiography (CTA) assessment of acute chest pain to safely reduce ED cost, time to discharge, and rate of hospital admission. These benefits must be weighed against the risk of ionizing radiation exposure and the influence of ED testing on rates of downstream coronary angiography and revascularization. Efforts at radiation minimization have quickly evolved, implementing technology such as prospective electrocardiographic gating and high pitch acquisition to significantly reduce radiation exposure over just a few years. CTA in the ED has demonstrated accuracy, safety, and the ability to reduce ED cost and crowding although its big-picture effect on total hospital and health care system cost extends far beyond the ED. The net effect of CTA is dependent also on the prevalence of coronary artery disease (CAD) in the population where CTA is used, which significantly influences rates of post-CTA invasive procedures such as angiography and coronary revascularization. These potential costs and

Maffel E, Seitun S, Guaricci A, Cademartiri F. Chest pain: coronary CT in the ER. Br J Radiol (2016); 89(1061): 20150954
Staniak HL, Bittencourt MS, Pickett C et al. Coronary CT angiography for acute chest pain in the emergency department. J Cardiovasc Comput Tomogr. 2014;8(5):359-67.

Pulmonary arteries

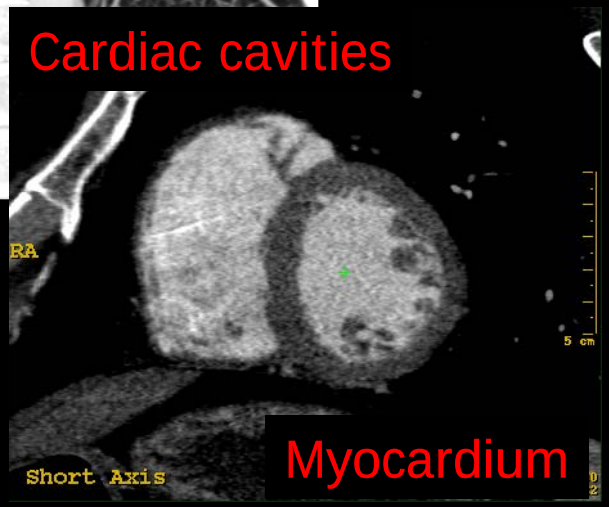


Coronary arteries



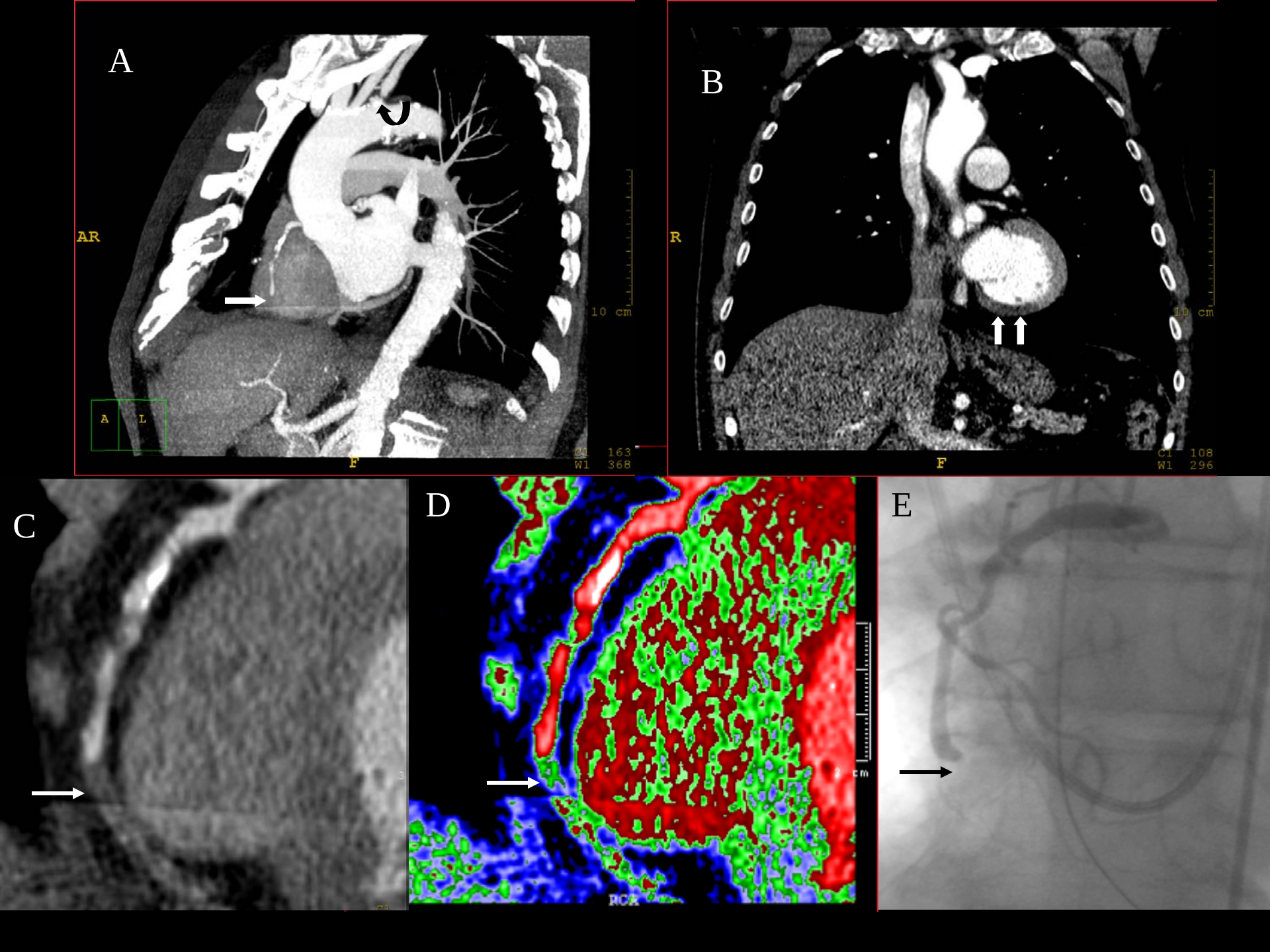
Lung

Cardiac cavities



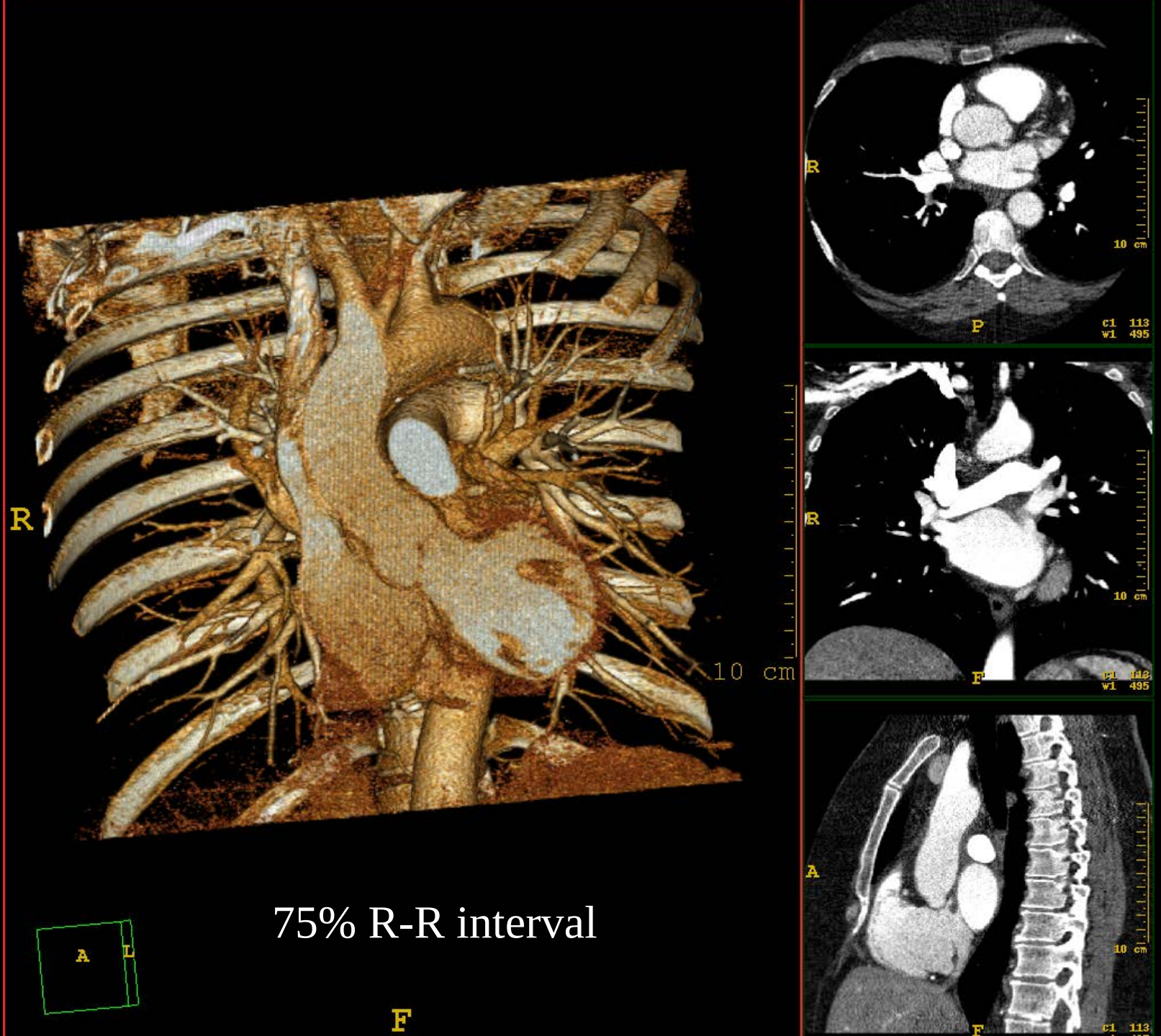
Myocardium

ECG-Dose modulation

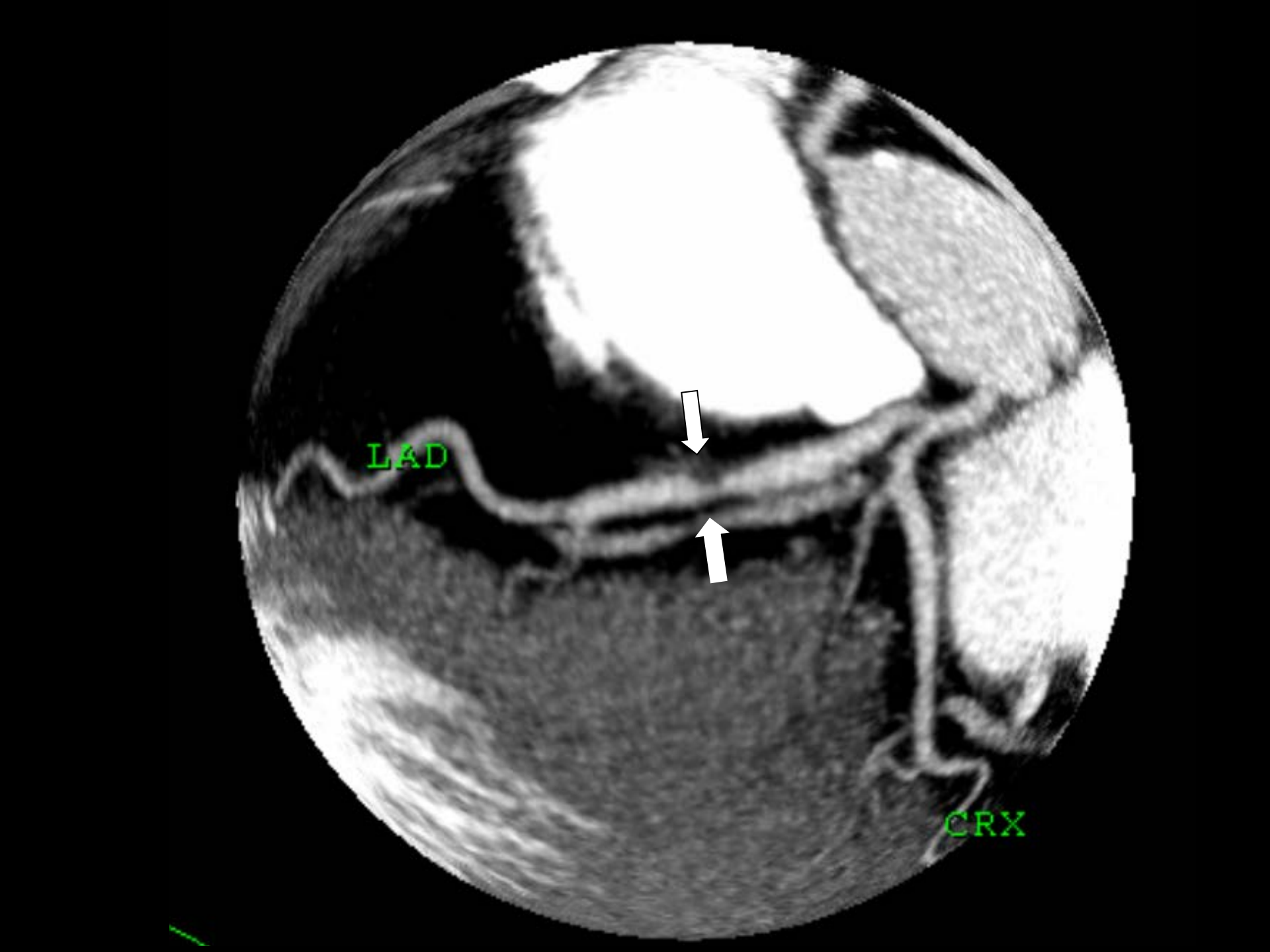

A
AR
10 cm
A
L
F
C1 163
W1 368
B
R
10 cm
F
C1 108
W1 296
C
D
RCR
E

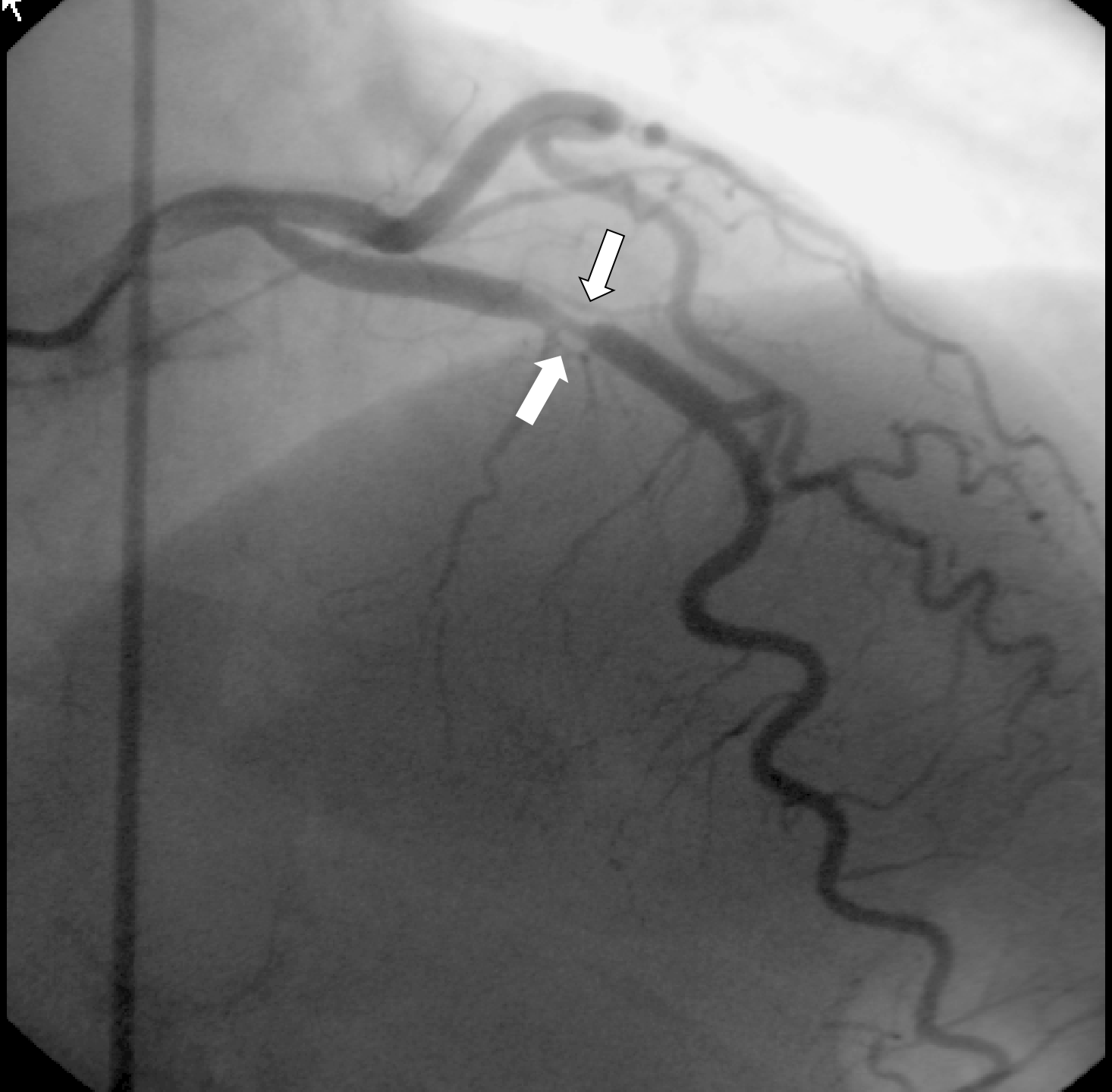
Histoire Clinique

- Femme de 59 ans avec douleurs thoraciques
- Arrêt du tabac 3 ans auparavant, 1 sœur avec maladie cardiaque ischémique
- Troponin I negative
- Rx thorax: normale
- CT-40 coupes/rotation-synchronisation cardiaque



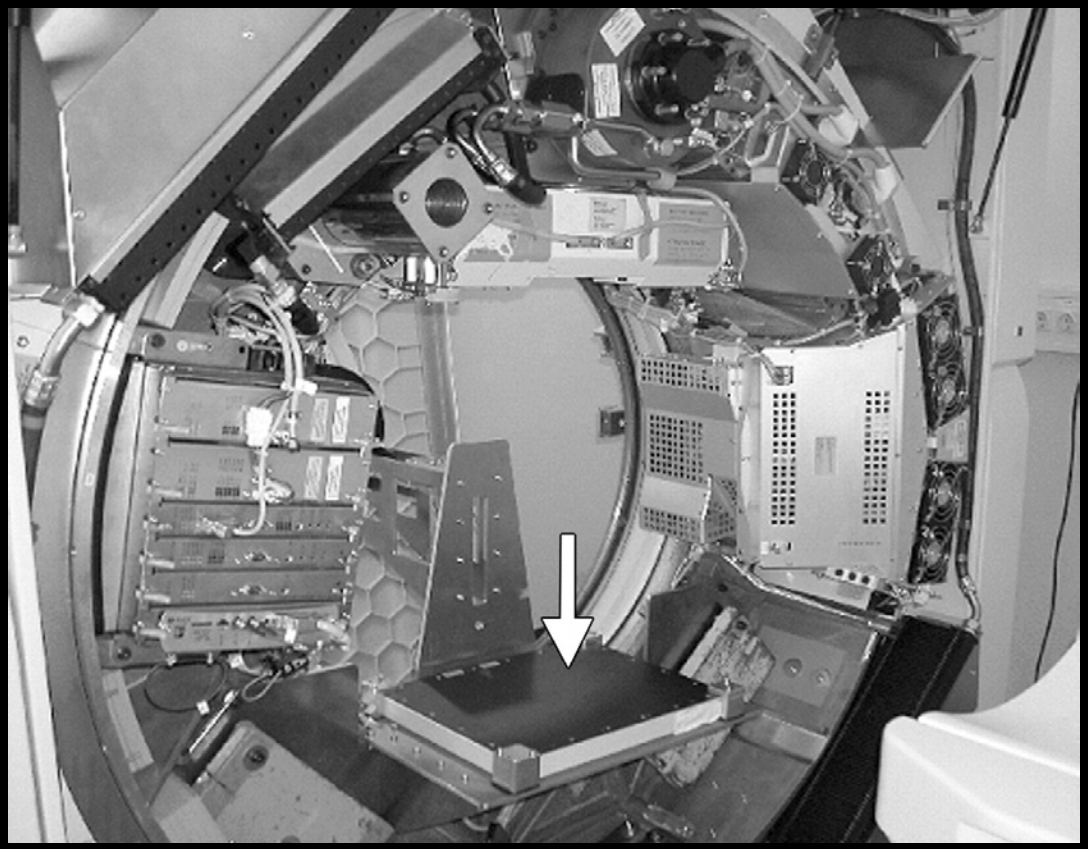
75% R-R interval

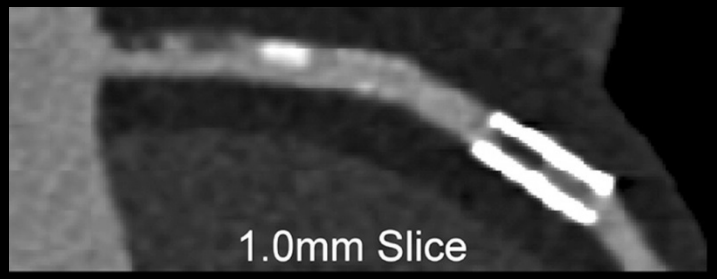

LAD
CRX



Perspectives

- Augmentation du champ couvert
  - 320 rangées de détecteurs
  - 16 cm
- Augmentation de la résolution temporelle < 100 msec
  - CT scanner double source
  - Rotation de 200 msec chez PMS
- Imagerie à double énergie

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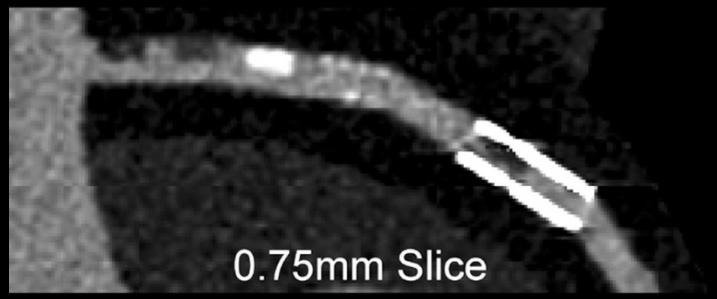
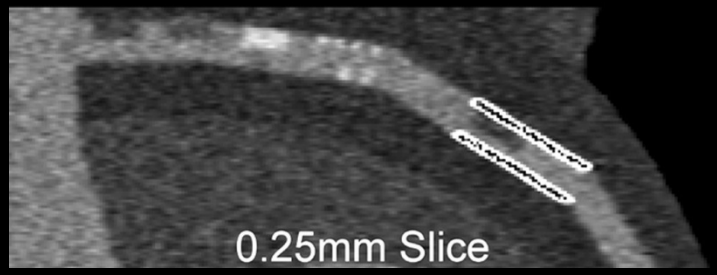

0.75mm Slice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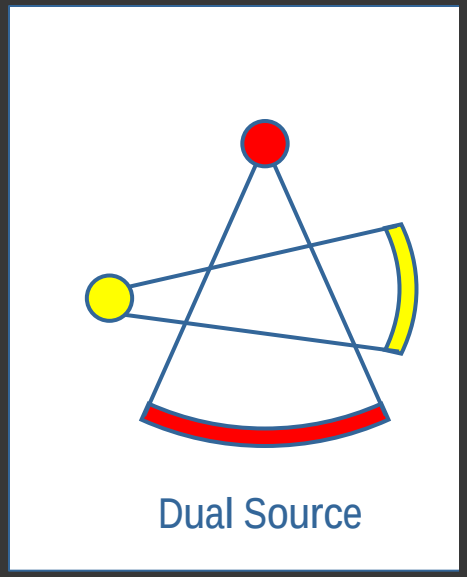
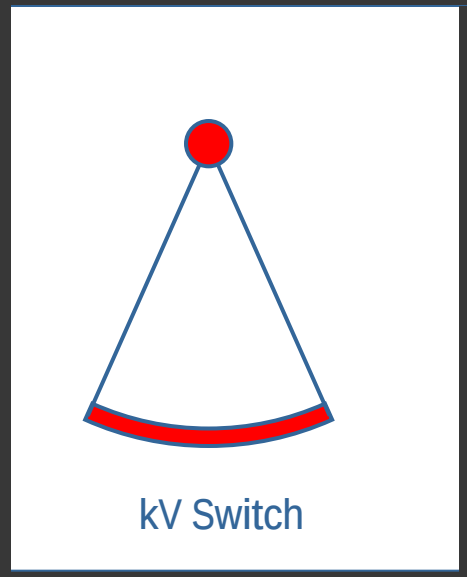
CT scanner double énergie



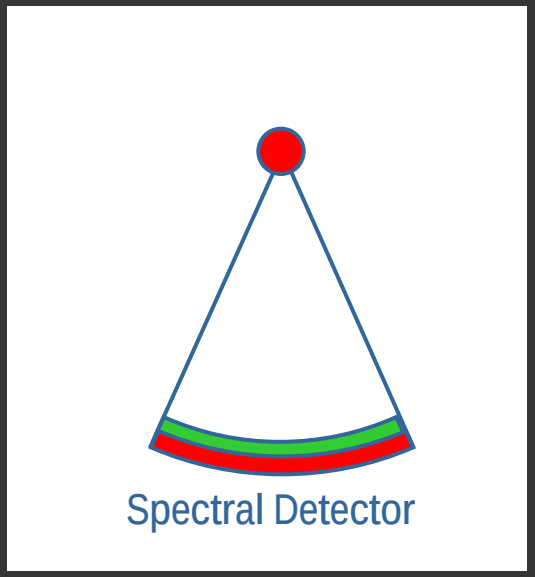
Simultaneous ☺
Non-isopedic ☹

Image Space ☹



Non-Simultaneous ☹
Non-isopedic ☹

Projection Space, after temporal and angular interpolations ☹



Simultaneous ☺
Isopedic ☺

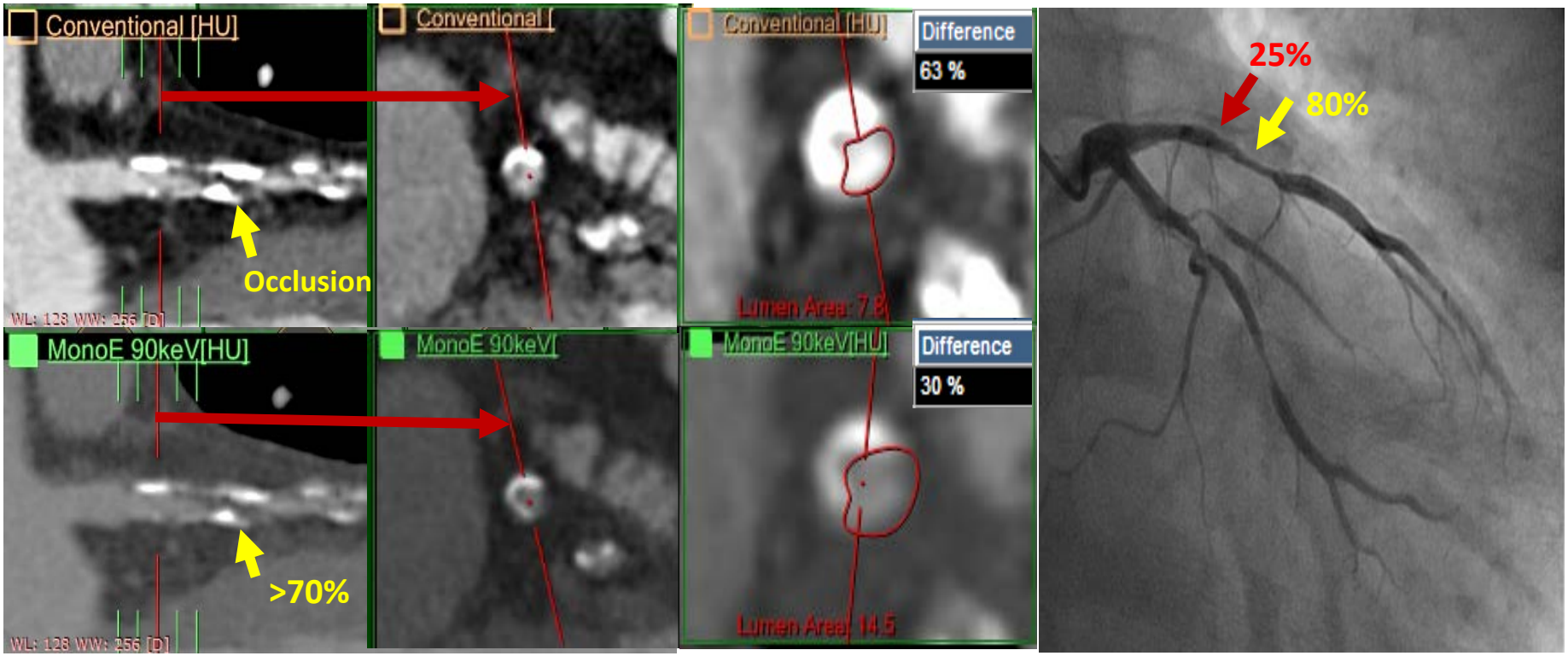
Projection Space ☺

IQon

Emission

Detection

Meilleure visualisation sténose



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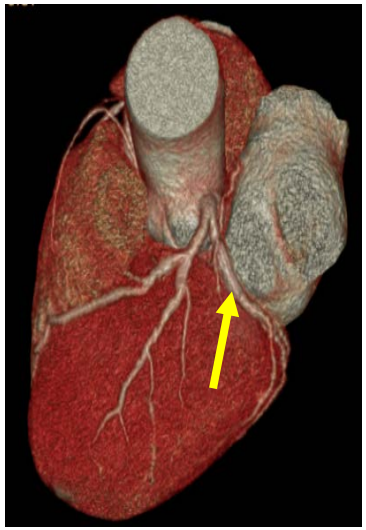
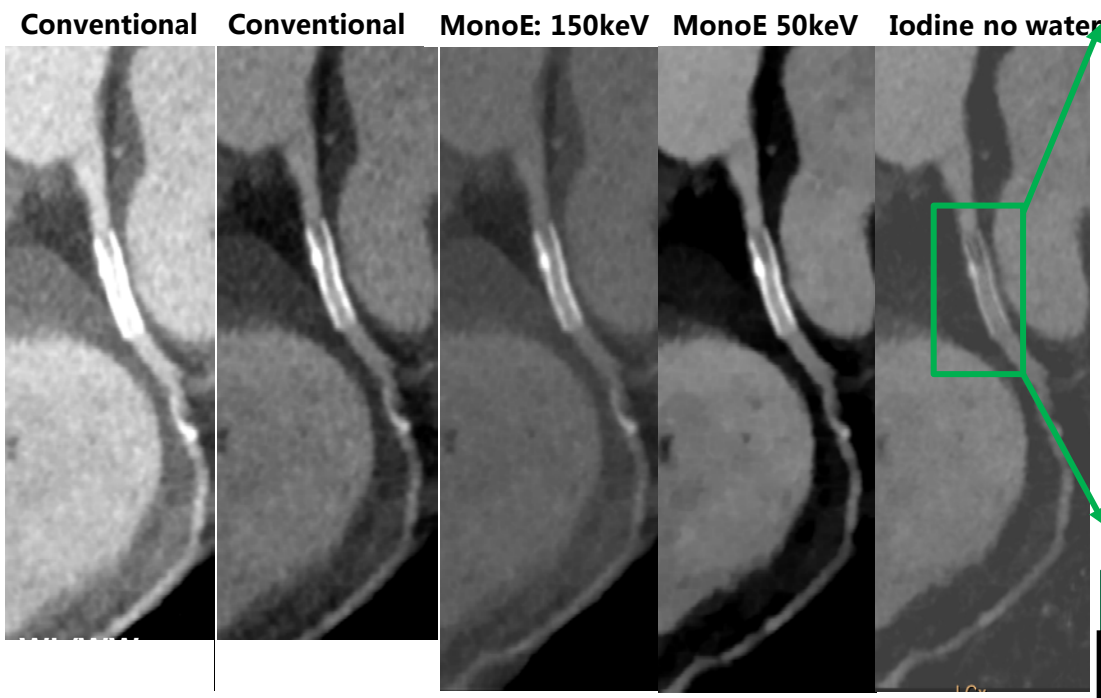
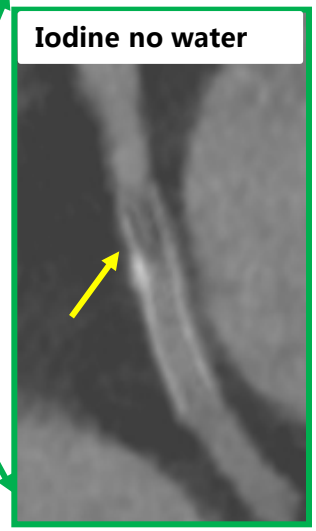
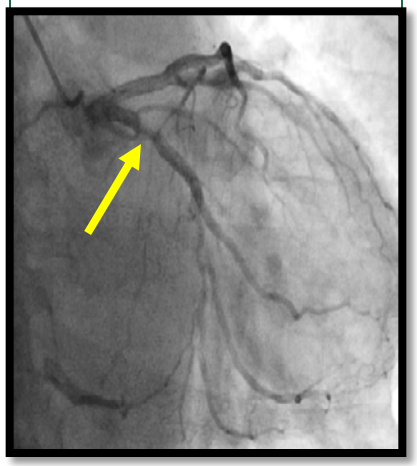
Meilleure visualisation stent









- **Conventional image : unable for in-lumen observation, even by adjusting window width and location. Real lumen diameter and lumen lesion is affected by stent artifact.**
- **Spectral image :**
  High MonoE 150keV effectively reduces artifact
  Low MonoE 50keV improves vascular contrast
  Iodine no water: indicates in-stent restenosis

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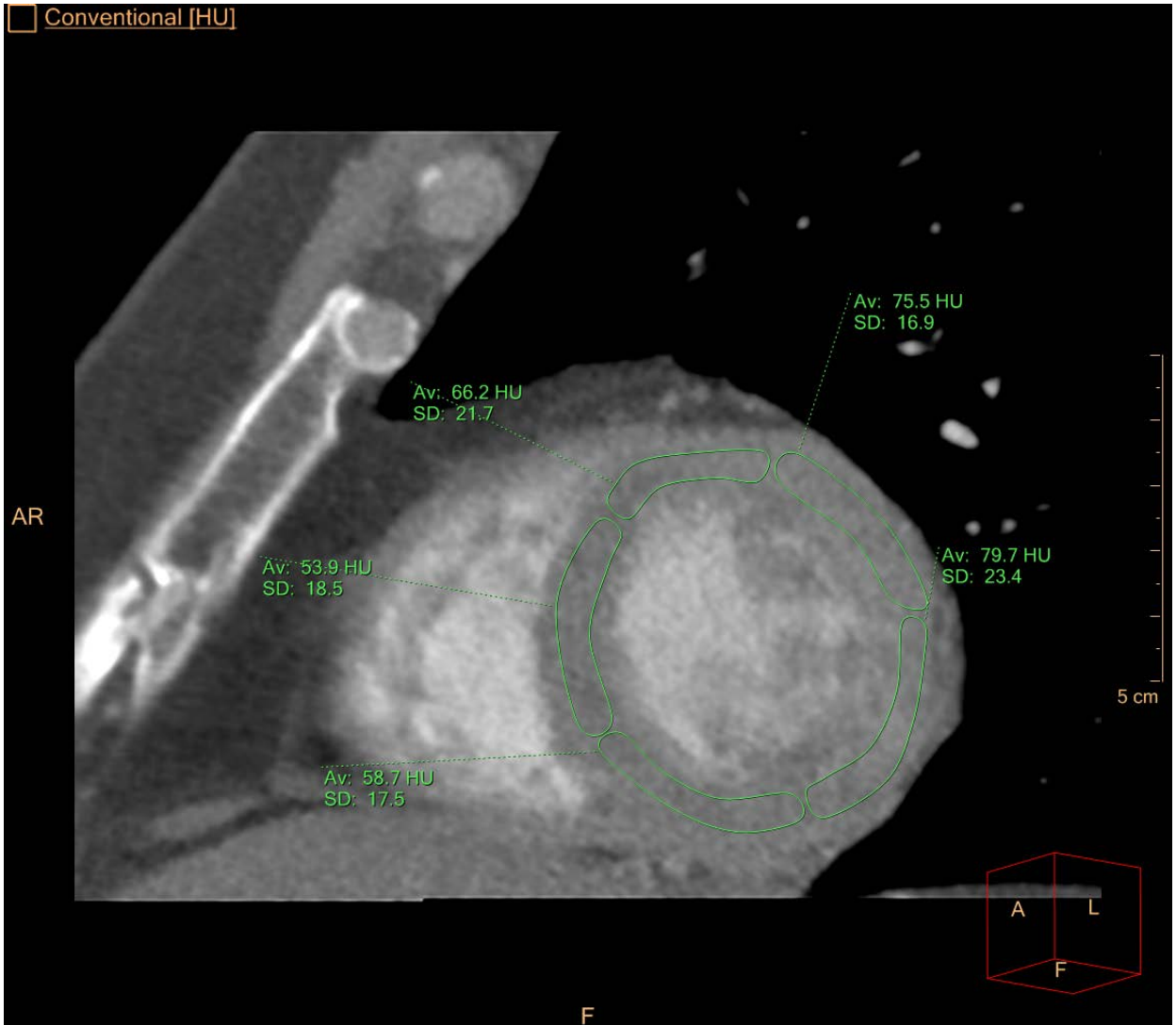
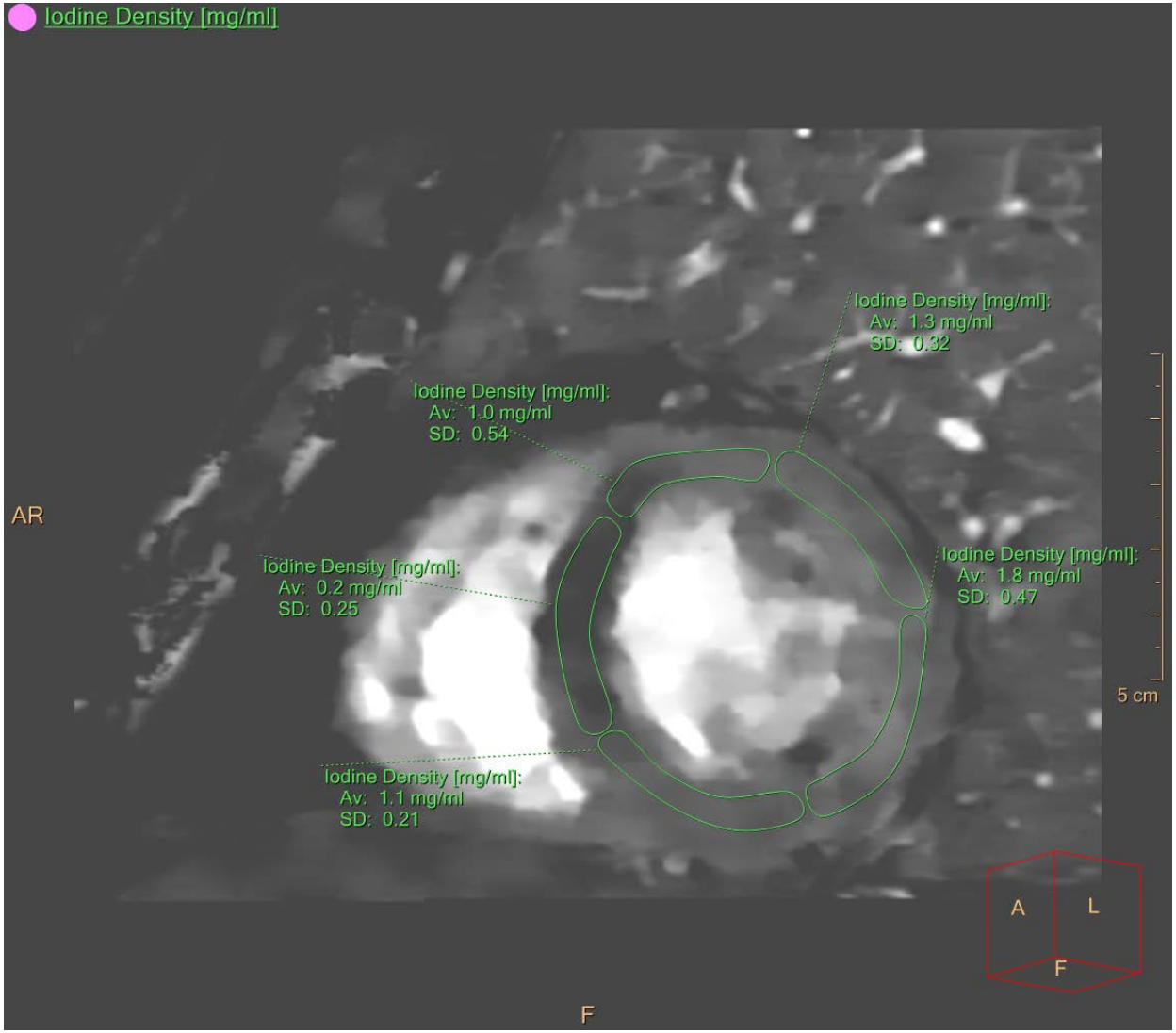
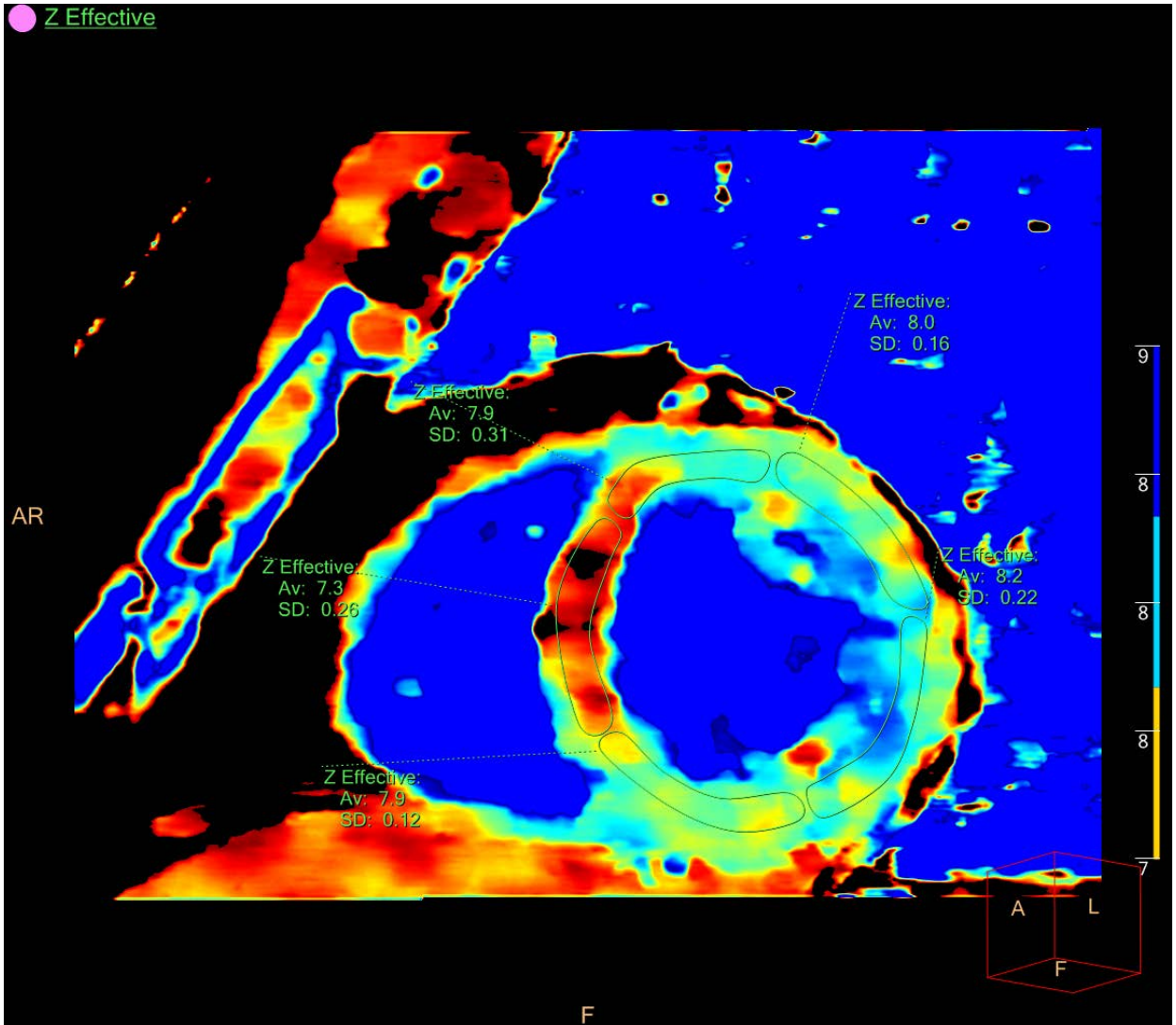
Distribution d’Iode myocardique

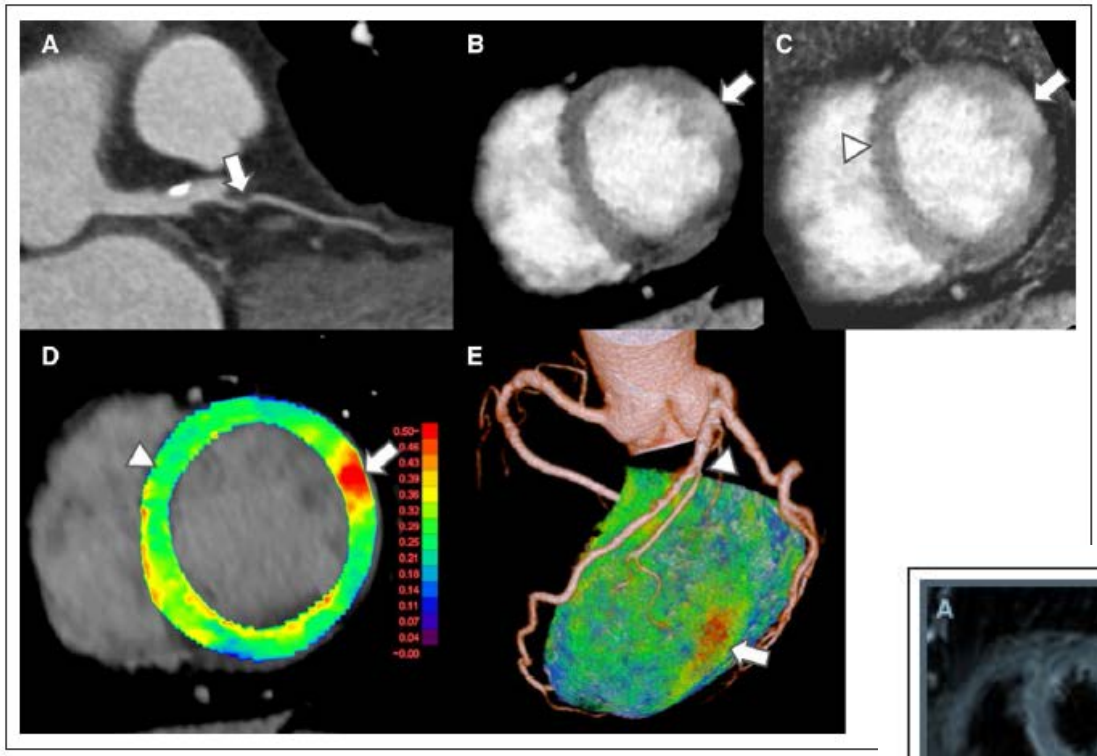


Distribution d’Iode myocardique



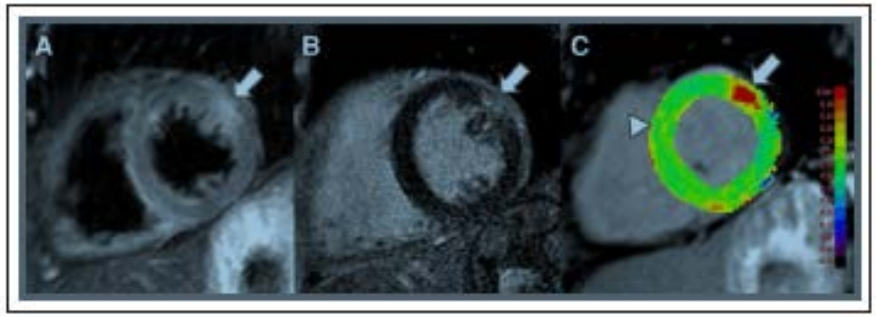
Distribution d'Iode myocardique

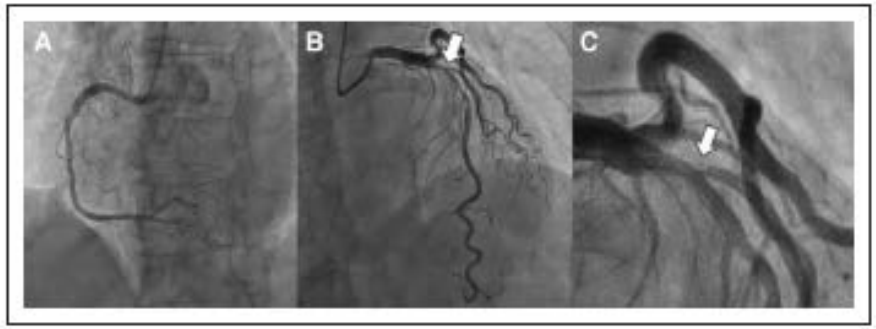




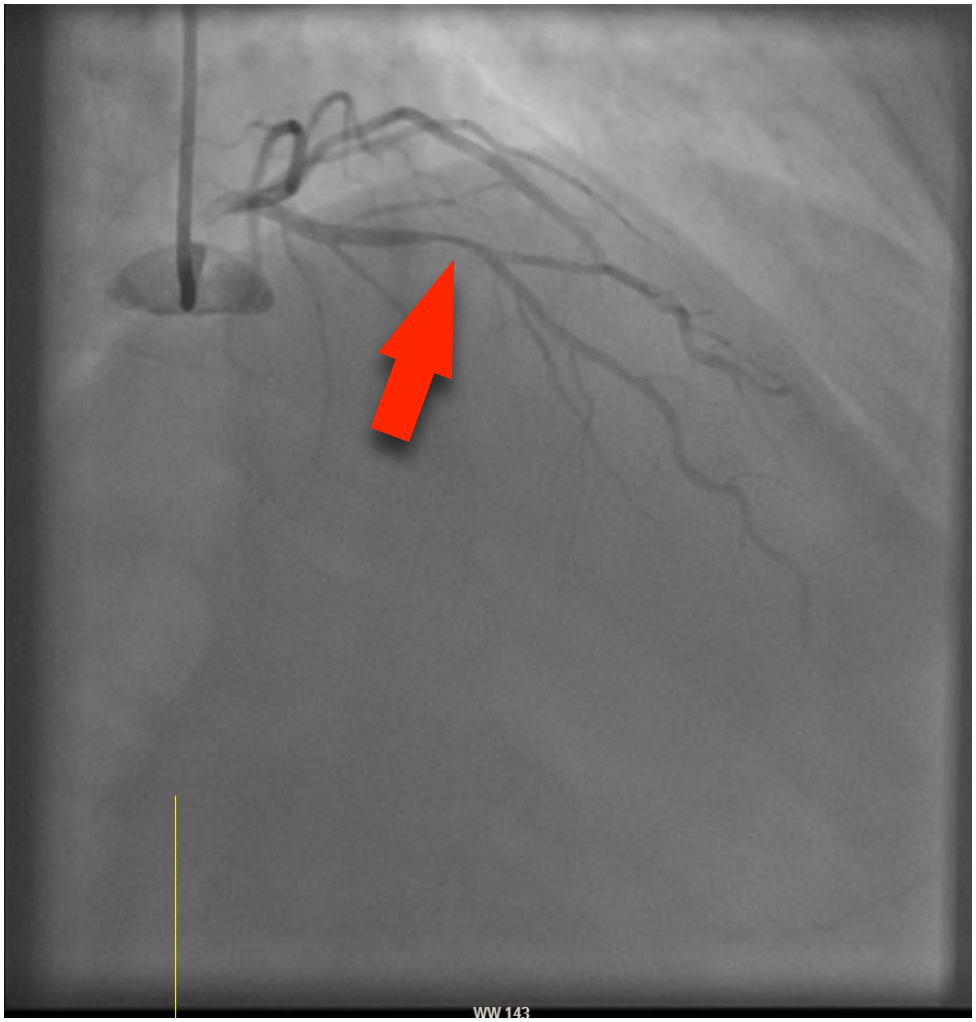
Clinical Usefulness of Dual-Energy Cardiac Computed Tomography in Acute Coronary Syndrome Using a Dual-Layer Spectral Detector Scanner

Taiki Nishihara, MD; Seitaro Oda, MD, PhD; Daisuke Sueta, MD, PhD; Yasuhiro Izumiya, MD, PhD; Koichi Kaikita, MD, PhD; Kenichi Tsujita, MD, PhD; Daisuke Utsunomiya, MD, PhD; Takeshi Nakaura, MD, PhD; Yasuyuki Yamashita, MD, PhD





Standard de reference - FFR angio = 0.72
IVA moyenne



Conclusions

- Le CT des artères coronaires est devenu un moyen diagnostic validé dans la mise au point de la maladie coronarienne
- Les progrès récents de l'imagerie MDCT dont l'imagerie spectrale vont encore élargir les indications et reculer les limites de cette nouvelle technique d'imagerie non invasive
- En raison de son irradiation et l'injection de produit de contraste iodé, ses indications doivent être posées de façon judicieuse