

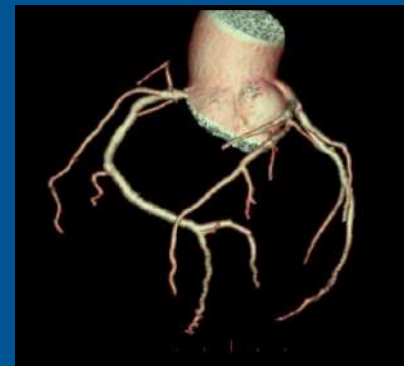


1-2-3 FÉVRIER 2023

MARSEILLE • PALAIS DU PHARO



# Interpréter « soi-même » le scanner coronaire



Thierry UNTERSEEH, pour l'équipe des cardiologues « scannéristes »  
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## CONFLITS D INTERET



- AUCUN



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# Les preuves s'accumulent....

**New major recommendations in 2019**

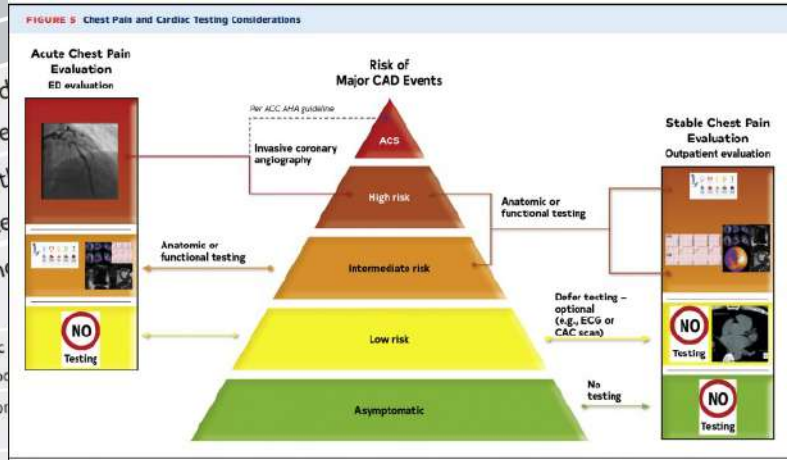
**Basic testing, diagnostics, and risk assessment**

Non-invasive functional imaging for myocardial ischaemia or coronary CTA is recommended for symptomatic patients in whom obstructive CAD cannot be excluded by clinical assessment. It is recommended that selection of the initial non-invasive diagnostic test be based on the characteristics that influence test performance, local expertise, and the availability of tests. Functional imaging for myocardial ischaemia is recommended if coronary CTA has shown to be non-diagnostic.

Invasive coronary angiography is recommended as an alternative test for myocardial ischaemia if non-invasive diagnostic test performance is low, local expertise is limited, or the test is non-diagnostic.

Invasive coronary angiography with the availability of invasive functional evaluation should be considered for confirmation of the diagnosis of CAD in patients with an uncertain diagnosis on non-invasive testing.

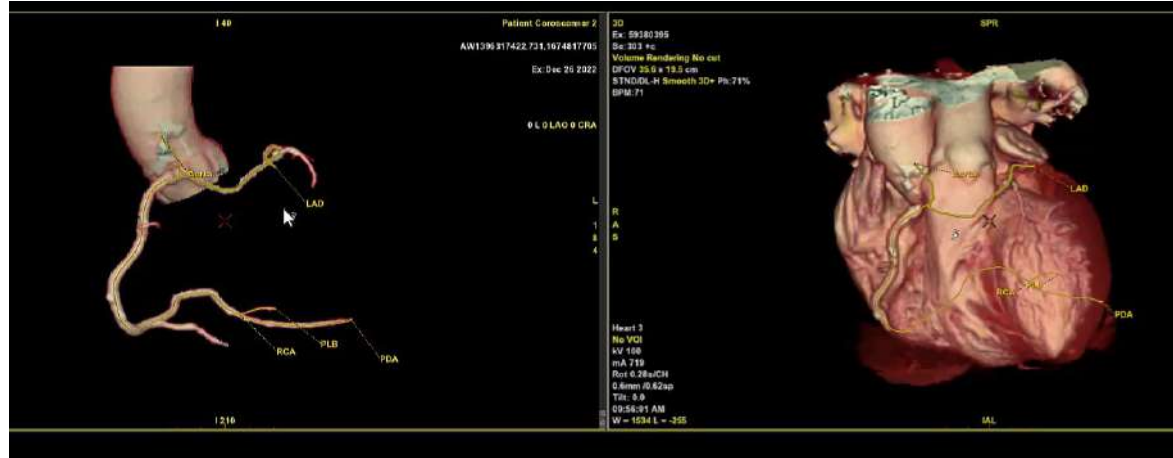
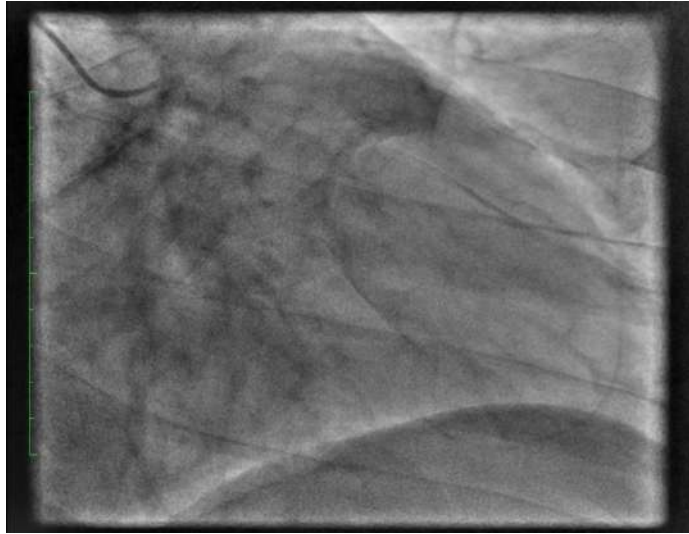
Coronary CTA should be considered as an alternative to invasive angiography if another non-invasive test is equivocal or non-diagnostic.



The choice of imaging depends on the clinical question of importance, to either a) ascertain the diagnosis of CAD and define coronary anatomy or b) assess ischemia severity among patients with an expected higher likelihood of ischemia with an abnormal resting ECG or those incapable of performing maximal exercise. ACS indicates acute coronary syndrome; CAC, coronary artery calcium; CAD, coronary artery disease; and ECG, electrocardiogram. Please refer to Section 4.1. For risk assessment in acute chest pain, see Figure 9. For risk assessment in stable chest pain, see Figure 11.

IIa	B
IIa	C

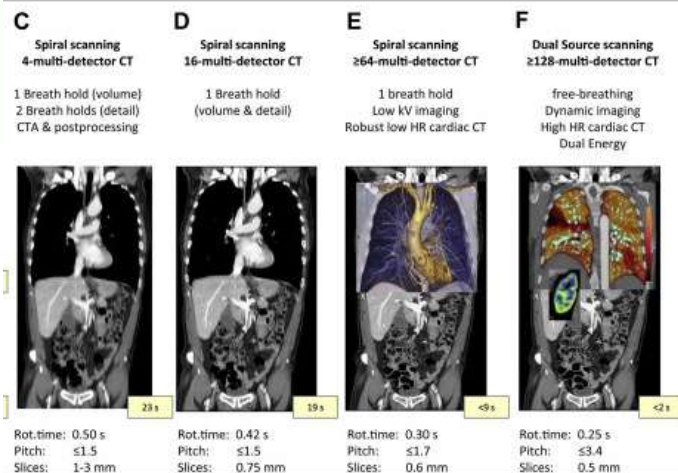
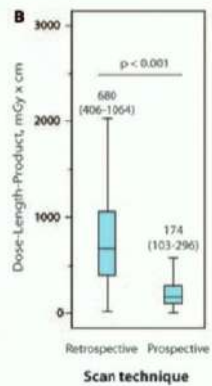
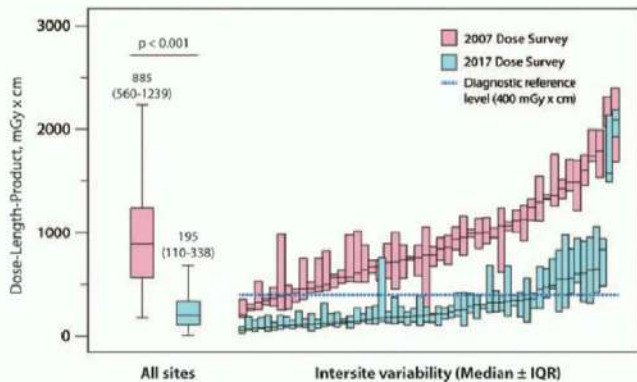
## Anomalie de naissance coronaire



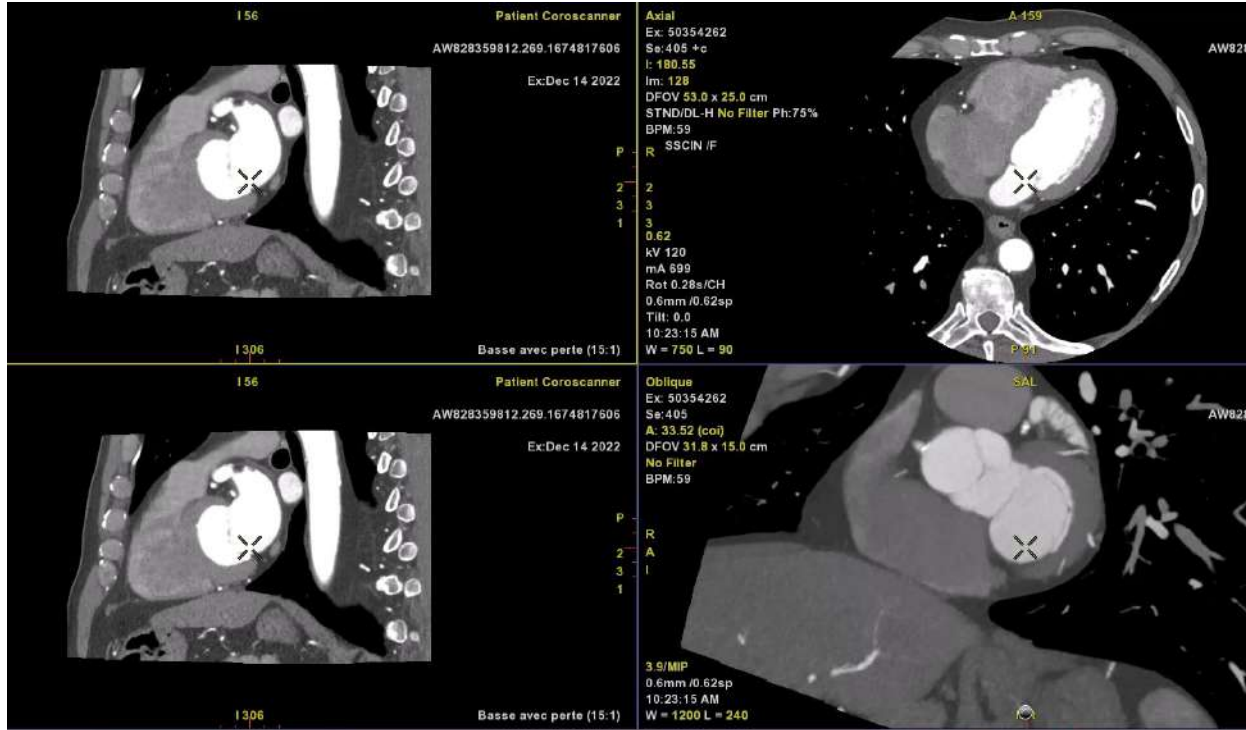
Francesco Gentile. Circulation 2021;144:983–996. Coronary Artery Anomalies

## D'OÙ VIENT T-ON???

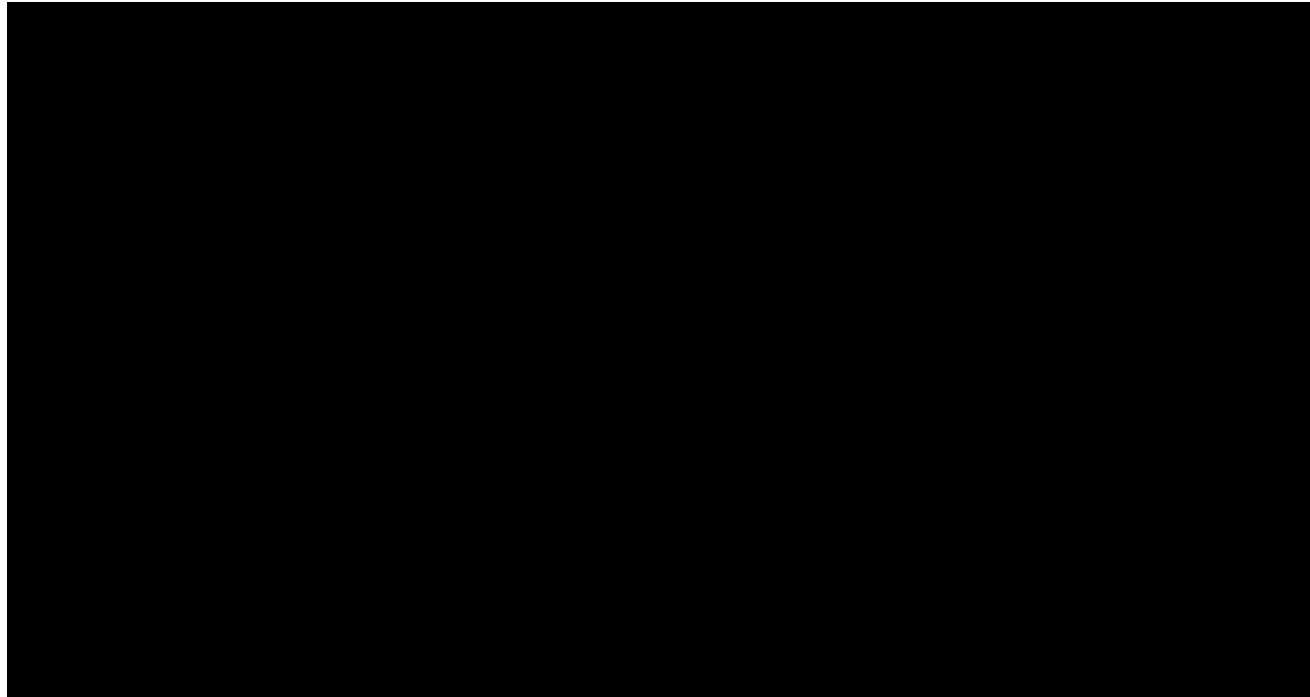
16 barrettes, acquisition 19 sec  
 64 barrettes, (1 apnée, acquisition <9 s  
 >128 barrettes et double Energie, (respiration libre, < 2s)



## Post traitement pénible ???



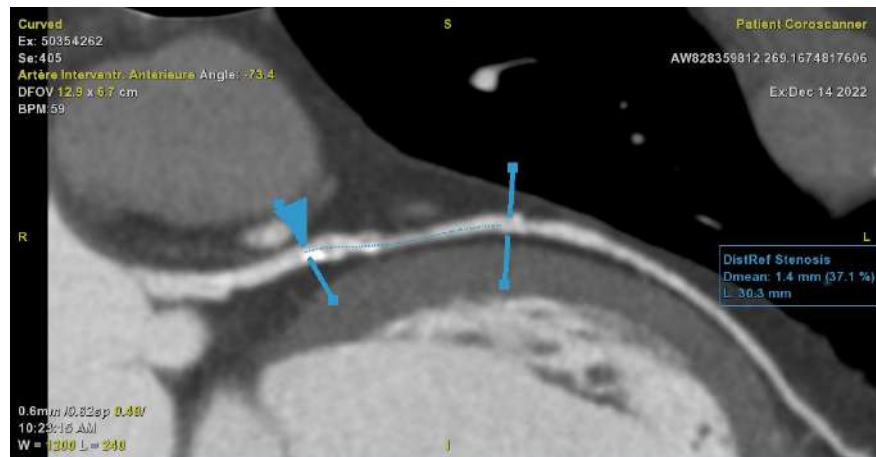
## L'analyse de la plaque: l'ADN du cardiologue interventionnel



## Un exemple de compte rendu



# Sténose IVA 37%!!





## CAD Rads

# Coronary Artery Disease – Reporting and Data System (CAD-RADS)

**TABLE 2** CAD-RADS Reporting and Data System for Patients Presenting With Stable Chest Pain

	Degree of Maximal Coronary Stenosis	Interpretation	Further Cardiac Investigation	Management
<b>CAD-RADS 0</b>	0% (No plaque or stenosis)	Documented absence of CAD*	None	Reassurance. Consider non-atherosclerotic causes of chest pain
<b>CAD-RADS 1</b>	1-24% - Minimal stenosis or plaque without stenosis	Minimal non-obstructive CAD	None	Consider non-atherosclerotic causes of chest pain Consider preventive therapy and risk factor modification
<b>CAD-RADS 2</b>	25-49% - Mild stenosis	Mild non-obstructive CAD	None	Consider non-atherosclerotic causes of chest pain Consider preventive therapy and risk factor modification, particularly for patients with non-obstructive plaque in multiple segments.
<b>CAD-RADS 3</b>	50-69% stenosis	Moderate stenosis	Consider functional assessment	Consider symptom-guided anti-ischemic and preventive pharmacotherapy as well as risk factor modification per guideline-directed care*** Other treatments should be considered per guideline-directed care***
<b>CAD-RADS 4</b>	A - 70-99% stenosis or B - 70-99% stenosis in 1 or 2 vessels or C - 70-99% stenosis in 3 vessels	Severe stenosis	A: Consider ICA**** or functional assessment B: ICA is recommended	Consider symptom-guided anti-ischemic and preventive pharmacotherapy as well as risk factor modification per guideline-directed care*** Other treatments should be considered per guideline-directed care***
<b>CAD-RADS 5</b>	100% (total occlusion)	Total coronary occlusion	Consider ICA and/or viability assessment	Consider symptom-guided anti-ischemic and preventive pharmacotherapy as well as risk factors modification per guideline-directed care*** Other treatments (including options of revascularization) should be considered per guideline-directed care***
<b>CAD-RADS N</b>	Non-diagnostic study	Obstructive CAD cannot be excluded	Additional or alternative evaluation may be needed	

The CAD-RADS classification should be applied on a per-patient basis for the distally most relevant (usually highest-grade) stenosis. All vessels greater than 1.5 mm in diameter should be graded for stenosis severity. CAD-RADS will not apply for smaller vessels (<1.5 mm in diameter). **MODIFIERS:** If more than one modifier is present, the symbol "?" (slash) should follow each modifier in the following order: First, modifier **N** (non-diagnostic), Second, modifier **S** (stenosis), Third, modifier **G** (graft), Fourth, modifier **V** (vulnerability). \*CAD - coronary artery disease. \*\*CAD-RADS 1 - This category should also include the presence of plaque with positive remodeling and no evidence of stenosis. \*\*\*Guideline-directed care per ACC Stable Ischemic Heart Disease Guidelines (Fihn et al. JACC 2012) (25). \*\*\*\*ICA - invasive coronary angiography.



Cury R.C., Abbara S., Achenbach S., et. al.: CAD-RADS™ coronary artery disease – reporting and data system. An expert consensus document of the Society of Cardiovascular Computed Tomography (SCCT), the American College of Radiology (ACR) and the North American Society for Cardiovascular Imaging (NASCI). J Cardiovasc Comput Tomogr 2016; 10: pp. 269-281.

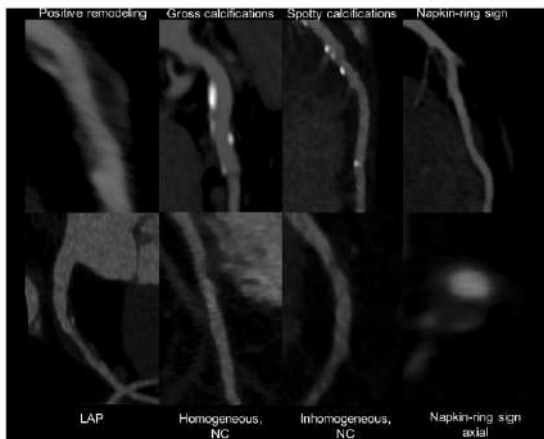
## Correspondance angio



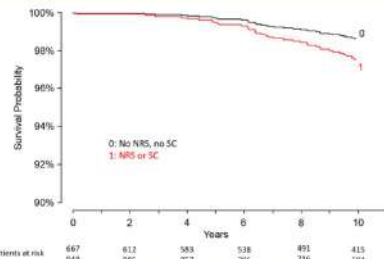
FFR 0,74



## De quelles plaques parle-t-on? HPR ?

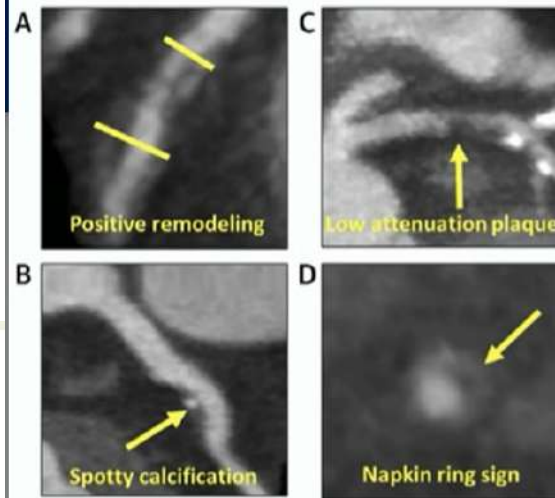


**Figure 1** Examples of the investigated plaque features on curved planar reformation images. LAP, low-attenuation plaque; NC, no plaque.



**Figure 5** Kaplan-Meier curves for event-free survival (primary endpoint) stratified according to the lack/presence of either spotty calcified plaque or napkin-ring sign. CAD, coronary artery disease.

### Features



Abdelrahman et al. JACC 2020

European Heart Journal - Cardiovascular Imaging (2020) 21, 237–248. Long-term prognostic value of morphological plaque features on coronary computed tomography angiography

## CAD RADS 2

**TABLE**  
**Table 8**  
 Summary of the main changes for 2022 CAD-RADS update when compared to the first version published in 2016.

	2016 CAD-RADS	Stenosis	Plaque	Suggested Recommendation for Report
Stenosis grading	CAD-RADS 0, 1, 2, 3, 4A, 4B and 5	CAD RADS 0	N/A	• Reassurance. Consider non-atherosclerotic causes of symptoms.
Plaque burden grading	No systematic classification	CAD RADS 1 or CAD RADS 2	P1	• Consider non-atherosclerotic causes of symptoms. • Consider risk factor modification and preventive pharmacotherapy.
			P2	• Consider non-atherosclerotic causes of symptoms. • Risk factor modification and preventive pharmacotherapy.
Modifiers	Four modifiers were introduced to complement classification First: modifier N (non-diagnostic) Second: modifier S (stent) Third: modifier G (graft) Fourth: modifier V (vulnerability)		P3 or P4	• Consider non-atherosclerotic causes of symptoms. • Aggressive risk factor modification and preventive pharmacotherapy.
		CAD RADS 3	P1/P2/P3/P4	• Consider CT-FFR, CTP or stress testing • Aggressive risk factor modification and preventive pharmacotherapy. • Other treatments (including anti-anginal therapy) should be considered per guideline directed care
			II1+	• Consider ICA, especially if frequent symptoms persist after guideline-directed medical therapy
		CAD RADS 4	P1/P2/P3/P4	• Consider ICA <sup>a</sup> or functional <sup>b</sup> assessment

ions) and replacement of modifier V (vulnerable) with HRP (high-

### Grading scale for Ischemia detection:

Terminology Modifier I	Meaning
I+	Indicates that CT Ischemia test was performed either with CT-FFR or myocardial CTP
I-	Indicates that CT-FFR or CTP demonstrates lesion-specific ischemia or reversible perfusion defect
I+/-	Indicates that CT-FFR or CTP is negative for lesion specific ischemia or reversible ischemia*
	Indicates that CT-FFR or CTP is borderline

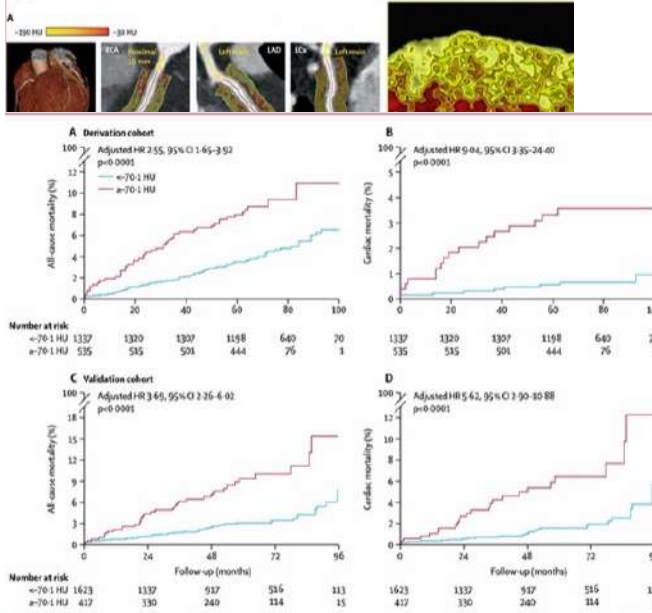
	Overall amount of coronary plaque	CAC	SIS *	Visual *
P1	Mild	1–100	≤2	1-2 vessels with mild amount of plaque
P2	Moderate	101–300	3–4	1-2 vessels with moderate amount; 3 vessels with mild amount of plaque
P3	Severe	301–999	5–7	3 vessels with moderate amount; 1 vessel with severe amount of plaque
P4	Extensive	>1000	≥8	2-3 vessels with severe amount of plaque

CAD-RADS™ 2.0 – 2022 Coronary Artery Disease – Reporting and Data System. Ricardo C. and all. Journal of the American College of Radiology, 2022-11-01, Volume 19, N 11, Pages 1185-1212.

# Le Futur

## Non-invasive detection of coronary inflammation using computed tomography and prediction of residual cardiovascular risk (the CRISP CT study): a post-hoc analysis of prospective outcome data

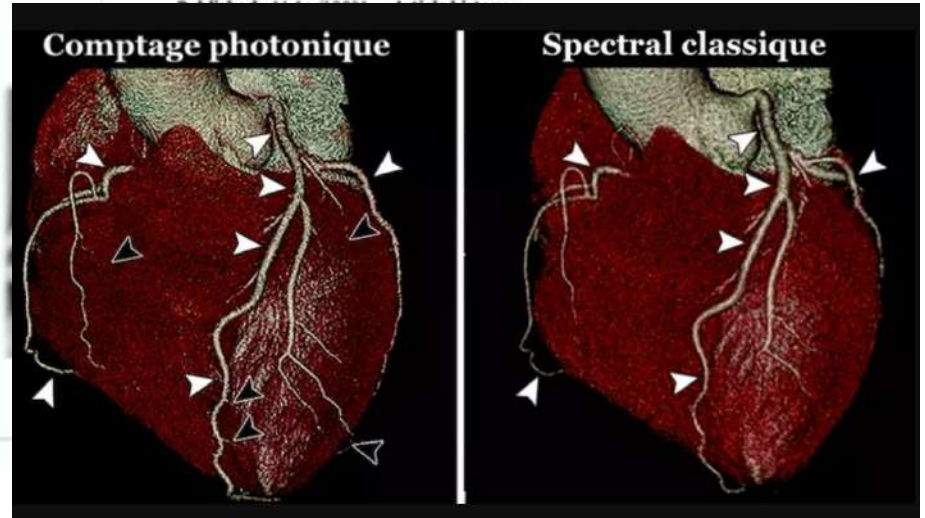
Evangelos F Oikarinen\*, Mohamed Marwan\*, Milind Y Desai\*, Jennifer Mansio, Alaa Alahki, Erika Hutt-Genters, Sheeno Thomas, Louis Henderson, Christos P Katsaris, Katharina E Thomas, Brian P Griffin, Scott D Flamm, Alexios S Antonopoulos, Chensong Shirodaria, Nikerit Sabharwal, John Deanfield, Stefan Neubauer, Jeremy C Hopewell, Keith M Channon, Stephan Achenbach, Chantalambas Antonarakis



## Impact of coronary calcium score and lesion characteristics on the diagnostic performance of machine-learning-based computed tomography-derived fractional flow reserve

Hyun Jung Koo, Joon-Won Kang, Soo-Jin Kang, Jihoon Kweon, June-Goo Lee, Jung-Min Ahn, Duk-Woo Park, Seung Whan Lee, Cheol Whan Lee, Seong-Wook Park ...  
Show more

European Heart Journal - Cardiovascular Imaging, jeab062,  
<https://doi.org/10.1093/ehjci/jeab062>



## CONCLUSION:

- **Simplicité (Apnée courte, 80 cc d'iode, peu irradiant)**
- **Rapidité (moins de 15 mn)**
- **Précision (RS<0,5 mm et bientôt 0,2mm)**
  
- **Plus value cardiologique:**
  - 1) **Vu la démographie médicale**
  - 2) **Décision making**
  
- **Nombreuses innovations technologiques à venir (FFR CT, ATC guidée par FFR CT, perfusion, inflammation etc..)**