

Strategie de dépistage du coronarien en 2021

Bernard De Bruyne

Cardiovascular Center Aalst, Belgium

Department of Cardiology, University Hospital Lausanne, Switzerland

Disclosure of Conflicts of Interest Bernard De Bruyne, MD, PhD (sept 2021)



• Institutional Research Support/Grants (for the CV Research Center Aalst)

Abbott Vascular, Medtronic, Biotronic, Boston Scientific, Coroventis, PieMedical, HeartFlow, Medis, CathWorks, Hexacath.

• Institutional Consultancies (for the CV Research Center Aalst)

Boston Scientific, Abbott Vascular, Medyria

Investment Funds/Equities in Medical Companies

Siemens, GE, Philips, Bayer, HeartFlow, Opsens, Edwards Life Sciences, Sanofi, Celyad, UCB

Involvement in Contract Research Organizations.

CoreAalst





Bugiardini and Merz, JAMA 2005, 293:477-484





Park SJ et al. Circulation 2011;124:951-962





Qasem A et al Annals Int Med, 2012, 157, 729





Montalescot et al Eur Heart J 2013;34:2949





Knuuti et al European Heart Journal 2020: 41,407-477





- Stress ECG
- Stress Echo/MRI
- Stress Scintigraphy 8

SPECT Ischemia and Outcome



The presence/absence of ischemia determines outcomes

Shaw L and Iskandrian J Nucl Cardiol 2004;11:171-85.

The extent of ischemia determines the benefit of revascularization

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Hachamovitch, R. et al. Circulation. 2003;107:2900-2906



The Ischemia Hypothesis

Reversible myocardial ischemia is associated with poor outcome and is the target of treatment

= Cornerstone of diagnostic/therapeutic strategies of CAD





- Stress ECG
- Stress Echo/MRI
- Stress Scintigraphy



Actually, we don't do that...

Non-Invasive Stress Testing in Patients Undergoing PCI





Among all PCI ≤ ¼ ever underwent any stress test And, when done, the information is not 'actionable'

Adapted from G.A. Lin et al JAMA 2008;300:1765-73; Marwick T et al Acta Cardiologica 1994



Influence of the age of the PHYSICIAN on the likelihood to undergo a non-invasive test



G.A. Lin et al JAMA 2008;300:1765-73



Actually, we don't do that...

Why? 1. Logistic reasons

Distrust in non-invasive testing
 Ischemia is not the culprit but a marker

Clinical Conditions in Which Non-Invasive Testing is Difficult to Perform or to Interpret



1. Elderly patients,

2. Obesity

- **3. Othopedic problems**
- 4. Multivessel disease, post-CABG patients
- **5. Non-Culprit in ACS**
- 6. Valvular Disease
- 7. Left main stenosis
- 8. LBBB, LVH, asynchrony, Poor LV function, Atrial Fibrillation, ...

75 % of patients...

But very seldom acknowledged in trials and meta-analyses



Actually, we don't do that...

Why? 1. Logistic reasons 2. Distrust in non-invasive testing

3. Ischemia is not the culprit but a marker

Comparator = angiography*

*presence of at least one stenosis > 50%

Guidelines on CCS and Revascularization Eur Heart J 2013;34:2949

	Sensitivity (%)	Specificity (%)
Exercise ECG a, 91, 94, 95	45–50	85–90
Exercise stress echocardiography ⁹⁶	80-85	80-88
Exercise stress SPECT ⁹⁶⁻⁹⁹	73–92	63-87
Dobutamine stress echocardiography ⁹⁶	79–83	82-86
Dobutamine stress MRI ^{5,100}	79–88	81–91
Vasodilator stress echocardiography ⁹⁶	72–79	92–95
Vasodilator stress SPECT ^{96, 99}	90–91	75-84
Vasodilator stress MRI ^{6,98, 100-102}	67–94	61-85
Coronary CTA ^{c,103-105}	95–99	64-83
Vasodilator stress PET ^{97, 99, 106}	81–97	74–91

Accuracy of Non-Invasive Testing ? 📩 Cardiovascular Center

Diagnosis of CAD

Performance of Non-Invasive Testing To Rule-In and Rule-Out "Significant CAD"









398,978 pts w/o known CAD

- 37.6% of obstructive disease
- 83.9% Non-invasive testing
- Rule in/rule out

Patel MR et al N Engl J Med 2010;362:886-895



Actually, we don't do that...

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Ischemia versus Plaque





Barking up the wrong tree: Ischemia is an (innocent) bystander

Ischemia versus Plaque



Ischemia is a marker of abnormal physical forces that take place at the level of the epicardial vessels



Mechanisms of Plaque Destabilization: The Role of Physical Forces





Mechanical constraints on coronary stenoses





Physical forces>>Material strength(hemodynamics)(histopathology)

WHY do patients enter the cath lab w/o non-invasive test and w/o CCTA



Misconceptions About CCTA

- 'Too sensitive/too little specificity'
- 'Done by radiologists'
- 'Calcium is a plague'
- 'Anyhow we have to go the cath lab'
- 'No functional information'
- 'No information about the microcirculation'

OK to rule out severe CAD, but not more



There is soooooo... much more than that...

The 'mille-feuille' of CCTA

- 1. Coronary angiography
- 2. Non-Invasive 3-Vessel FFR
- 3. Non-Invasive PPG (PPG_{CT})
- 4. PCI planner
- 5. Plaque reconstruction
- 6. R_µ and MRR_{CT} (microcirculation)

1. Coronary Angiography (grey scale)

Anatomy of the LM/RCA LVEF, LV mass, Mass at risk Coron angiogram SYNTAX score (functional)



Cardiologists must take ownership of coronary CT, (akin echo...)

Aalst CT Course for Interventional Cardiologists

(Drs Collet, Andreini,

1. Coronary Angiography



- Unity of time
- Unity of place
- Unit of action

The CT must be interpreted by the person who will use the information ²⁹



Functional Information

- **1. Coronary angiography**
- 2. Non-Invasive 3-Vessel FFR
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- 4. PCI planner
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Focality vs Diffuseness

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Collet C et al. J Am Coll Cardiol 2019;74:1772-84



Nagumo S, Collet C, Sonck J et al Clin Cardiol. 2021;1–9. <u>https://doi.org</u> /10.1002/clc.23551

Predicting what will be the Post PCI FFR?

- 1. Coronary angiography
- 2. Non-Invasive 3-Vessel FFR
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Exploring the Wall/Plaque

- **1. Coronary angiography**
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Comparison of IVUS and CT

0.5 mm Interval

0.03 mm

Interval



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"Napkin ring" sign





Comparison of IVUS and CT



Calcium plaque





Concept of CT-Guided PCI





Collet C, Sonck J et al JACC CV imaging 2020



Exploring the "Black Box"

- **1. Coronary angiography**
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Quantifying Absolute Microvascular Resistance

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De Bruyne B, Pijls N, Collet C, Fearon W et al. JACC In Press



Quantifying Absolute Myocardial Flow ?

- **1.** Coronary angiography
- 2. Non-Invasive 3-Vessel FFR
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Papanolis L, Taylor C, Vignon-Clementiel I et al. Ann Biom Engin, 2021,49:1432–1447



Quantifying Absolute Microvascular Resistance

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Concluding Remarks (about CCTA)



- → La CCTA devrait devenir le principal test non-invasif en cas de suspicion
- → CCTA devrait être disponible chez presque tous les patients qui ont une coronarographie

2. Les cardiologues devrait s'approprier le CCTA...

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Stratégie de dépistage du coronarien en 2021 🛛 🛃 Cardiovascular Center

Anamnèse et Facteurs de risques







