

Cas cliniques de revascularisation myocardiques : Des recommandations à la pratique...

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Guidelines on myocardial revascularization

The Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

Developed with the special contribution of the European Association for Percutaneous Cardiovascular Interventions (EAPCI)[†]

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The target of revascularization therapy is myocardial ischaemia, not the epicardial coronary disease itself.

Revascularization procedures performed in patients with documented ischaemia reduce total mortality(1) through reduction of ischaemic burden.(2)

Discrepancies between the apparent anatomical severity of a lesion and its functional effects on myocardial blood supply are common, especially in stable CAD. Thus, functional assessment, non-invasive or invasive, is essential for intermediate stenoses.

Revascularization of lesions without functional significance can be deferred.(3)

1. Davies RF, Goldberg AD, Forman Set al. ACIP study. *Circulation* 1997; 95:2037–43.

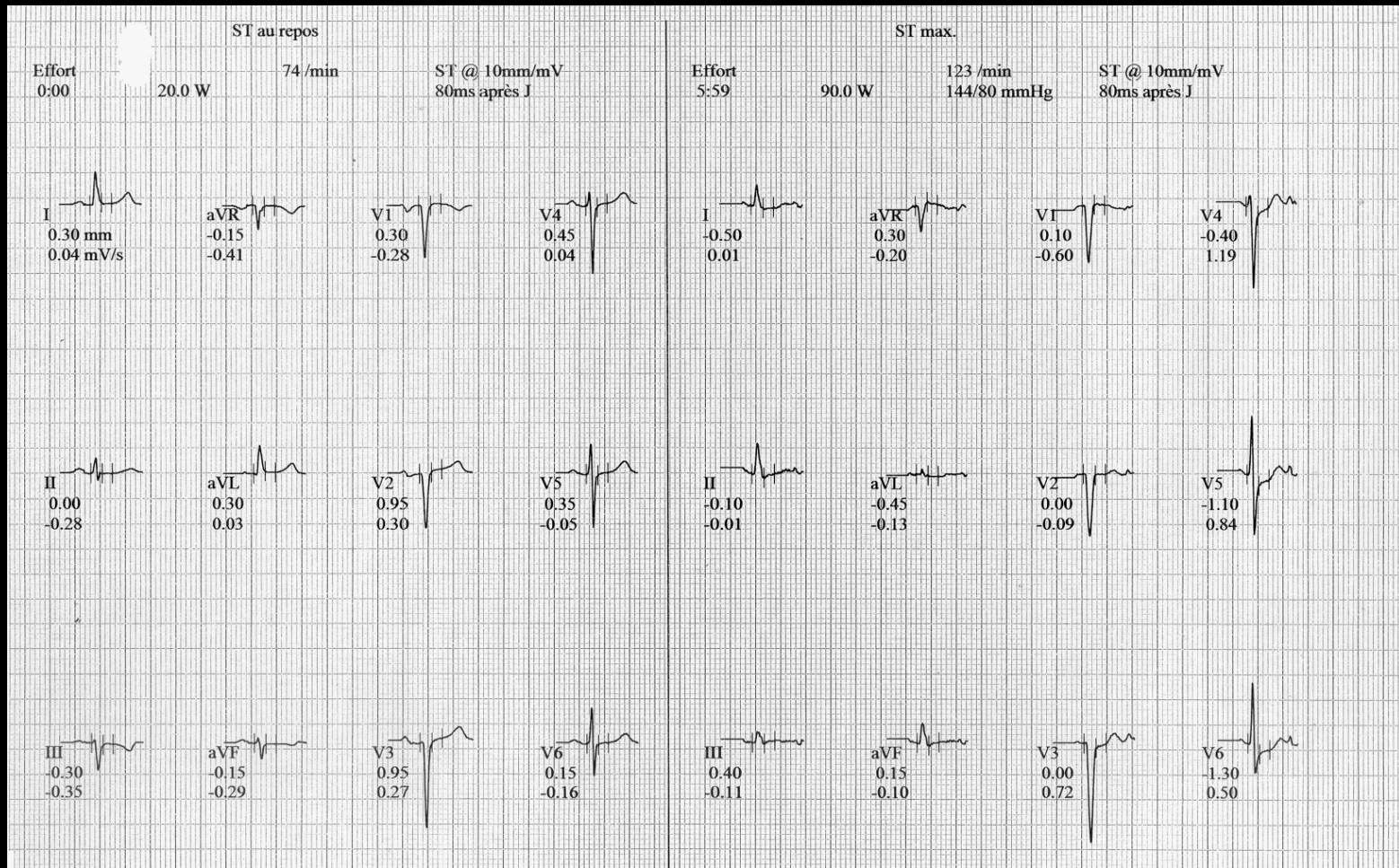
2. Shaw LJ, Berman DS, Maron DJ et al. COURAGE trial nuclear substudy *Circulation* 2008 ;117:1283–91.

3. Pijls NH, van Schaardenburgh P, Manoharan G et al : 5-year follow-up of the DEFER Study. *J Am Coll Cardiol* 2007;49:2105-11.

- La première étape pour une prise en charge optimale du coronarien est donc l'étape diagnostique.
- A l'exception des patients instables ayant des critères de sévérité nécessitant une coronarographie en urgence, tout patient doit faire l'objet d'une évaluation fonctionnelle non invasive soigneuse avant coronarographie +++

■ Mr J...médecin de 62 ans

- Angor stable CI II, apparu depuis 3 mois, l'empêchant de s'adonner à la pratique du sport et le gênant en consultation
- Seul FR connu : Hérédité (père ponté à 67 ans)



Indications of different imaging tests for the diagnosis of obstructive coronary artery disease and for the assessment of prognosis in subjects without known coronary artery disease

	Asymptomatic (screening)	Symptomatic			Prognostic value of positive result ^a	Prognostic value of negative result ^a
		Pretest likelihood ^b of obstructive disease				
		Low	Intermediate	High		
Anatomical test						
Invasive angiography	III A	III A	IIb A	I A	I A	I A
MDCT angiography	III B ^c	IIb B	IIa B	III B	IIb B	IIa B
MRI angiography	III B	III B	III B	III B	III C	III C
Functional test						
Stress echo	III A	III A	I A	III A ^d	I A	I A
Nuclear imaging	III A	III A	I A	III A ^d	I A	I A
Stress MRI	III B	III C	IIa B	III B ^d	IIa B	IIa B
PET perfusion	III B	III C	IIa B	III B ^d	IIa B	IIa B

^aFor the prognostic assessment of known coronary stenosis, functional imaging is similarly indicated.

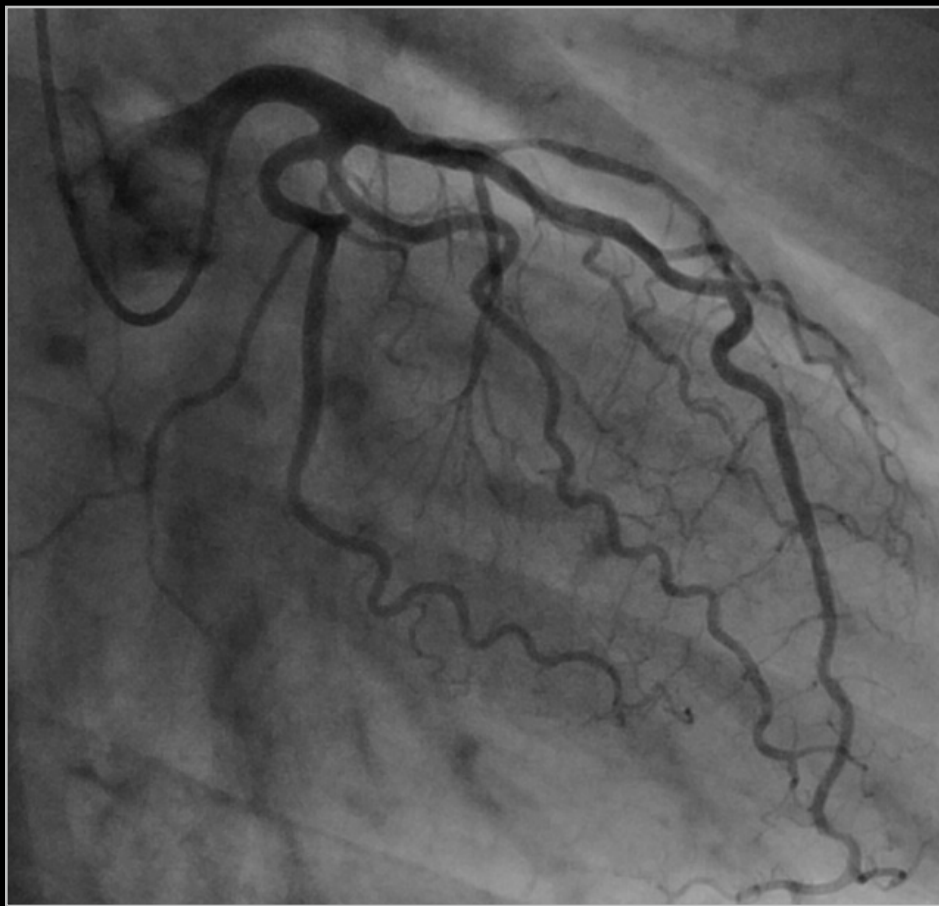
^bThe pretest likelihood of disease is calculated based on symptoms, sex, and risk factors.

^cThis refers to MDCT angiography, not calcium scoring.

^dIn patients with obstructive CAD documented by angiography, functional testing may be useful in guiding the revascularization strategy based on the extent, severity, and localisation of ischaemia.

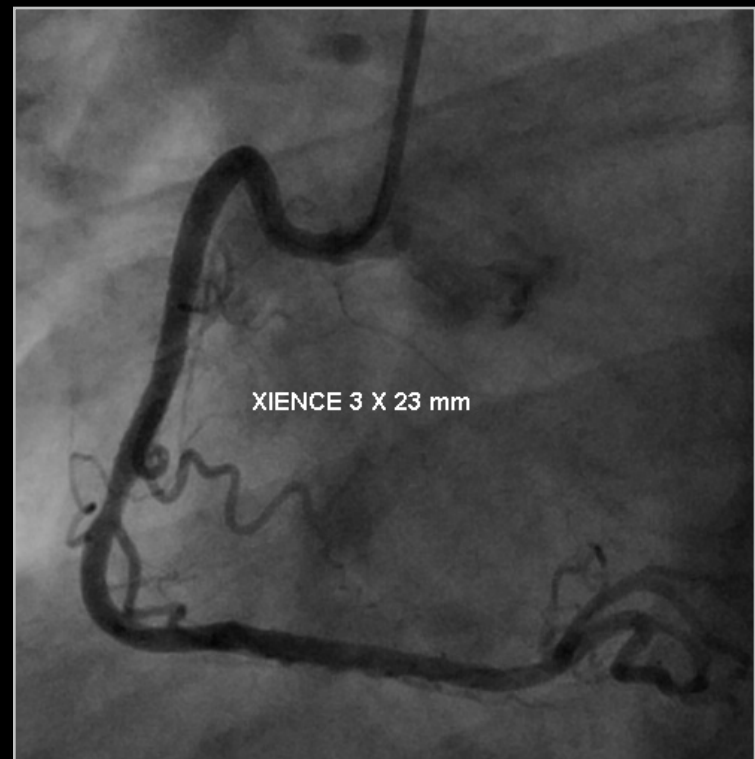
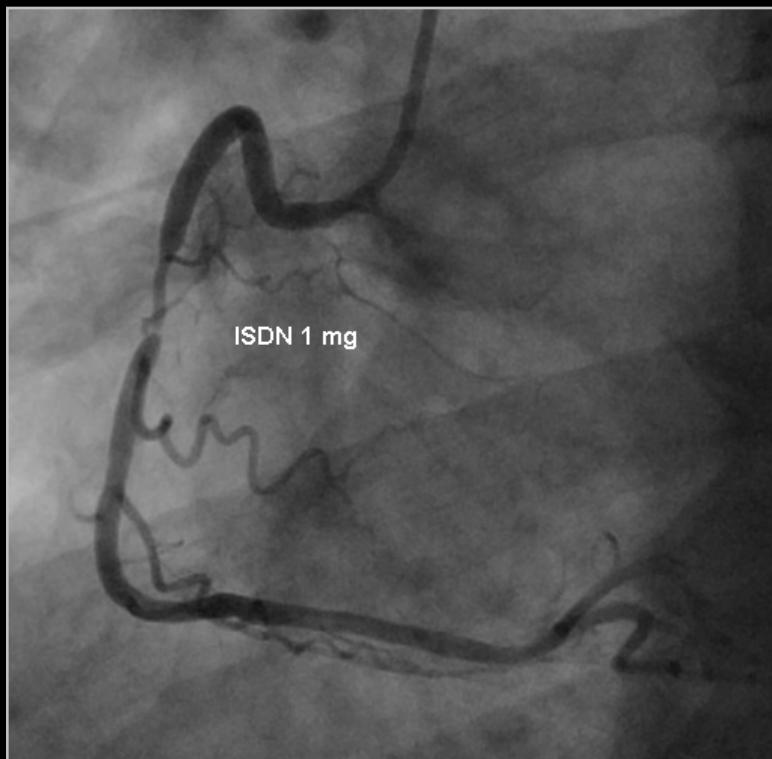
CAD = coronary artery disease; MDCT = multidetector computed tomography; MRI = magnetic resonance imaging; PET = positron emission tomography.

■ Mr J...62 ans



■ Mr J...62 ans

Lésion critique CD II effacée par une angioplastie adhoc avec
implantation d'un stent actif



	Subset of CAD by anatomy	Class ^a	Level ^b
For prognosis	Left main >50% ^d	I	A
	Any proximal LAD >50% ^d	I	A
	2VD or 3VD with impaired LV function ^d	I	B
	Proven large area of ischaemia (>10% LV)	I	B
	Single remaining patent vessel >50% stenosis ^d	I	C
	IVD without proximal LAD and without >10% ischaemia	III	A



Indications for revascularization in stable angina or silent ischaemia



For symptoms	Any stenosis >50% with limiting angina or angina equivalent, unresponsive to OMT	I	A
	Dyspnoea/CHF and >10% LV ischaemia/viability supplied by >50% stenotic artery	IIa	B
	No limiting symptoms with OMT	III	C

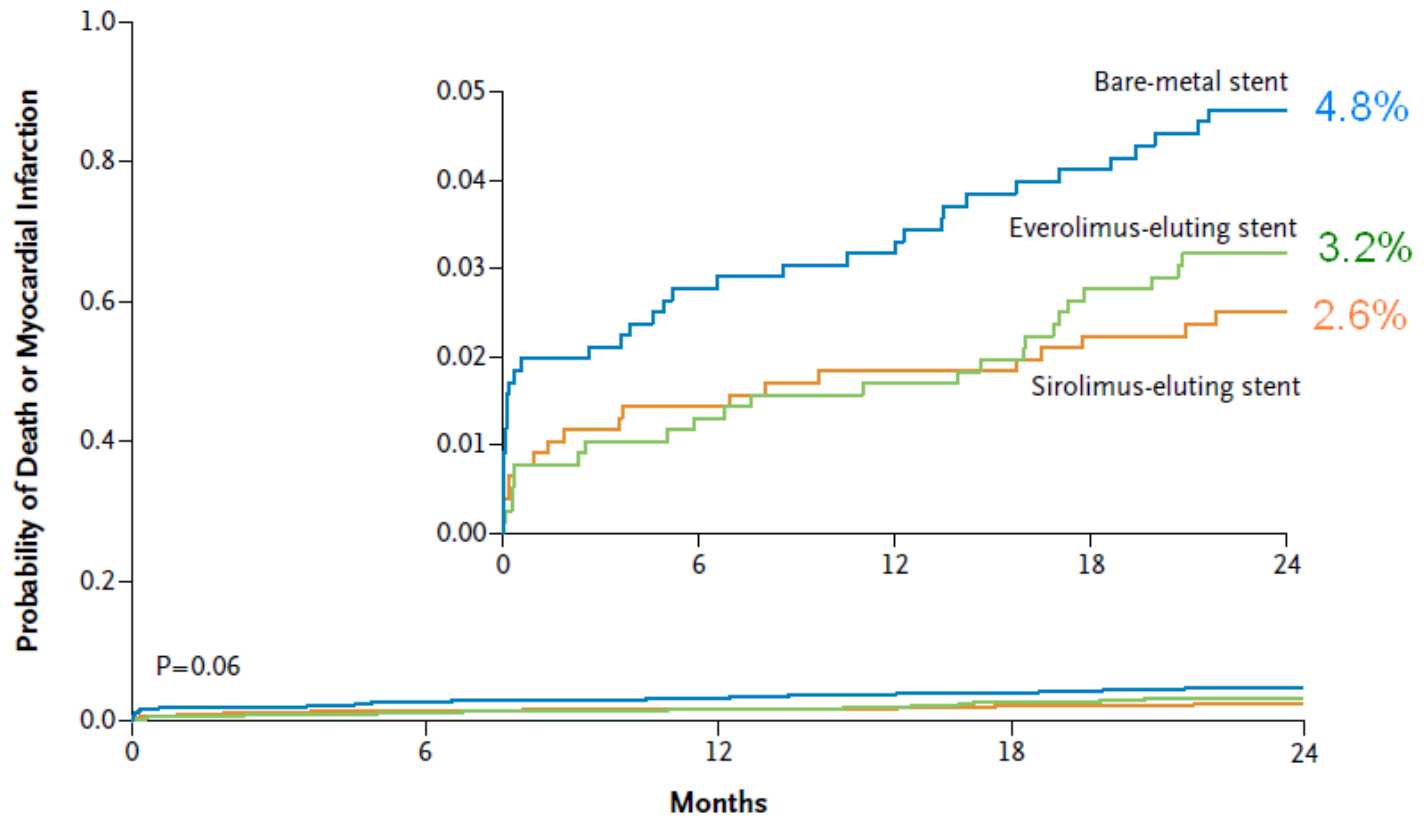
Indications for coronary artery bypass grafting vs. percutaneous coronary intervention in for stable patients with lesions suitable for both procedures and low predicted surgical mortality

Subset of CAD by anatomy	Favours CABG	Favours PCI	Ref.
IVD or 2VD - non-proximal LAD	IIb C	I C	—

DES^d are recommended for reduction of restenosis/re-occlusion, if no contraindication to extended DAPT.

I

A



No. at Risk

Sirolimus-eluting stent	775	746	742	728	567
Everolimus-eluting stent	774	753	745	729	546
Bare-metal stent	765	734	724	707	541

Ad hoc PCI

Haemodynamically unstable patients (including cardiogenic shock).

Culprit lesion in STEMI and NSTEMI-ACS.

Stable low-risk patients with single or double vessel disease (proximal LAD excluded) and favourable morphology (RCA, non-ostial LCx, mid- or distal LAD).

Non-recurrent restenotic lesions.

Revascularization at an interval

Lesions with high-risk morphology.

Chronic heart failure.

Renal failure (creatinine clearance <60 mL/min), if total contrast volume required >4 mL/kg.

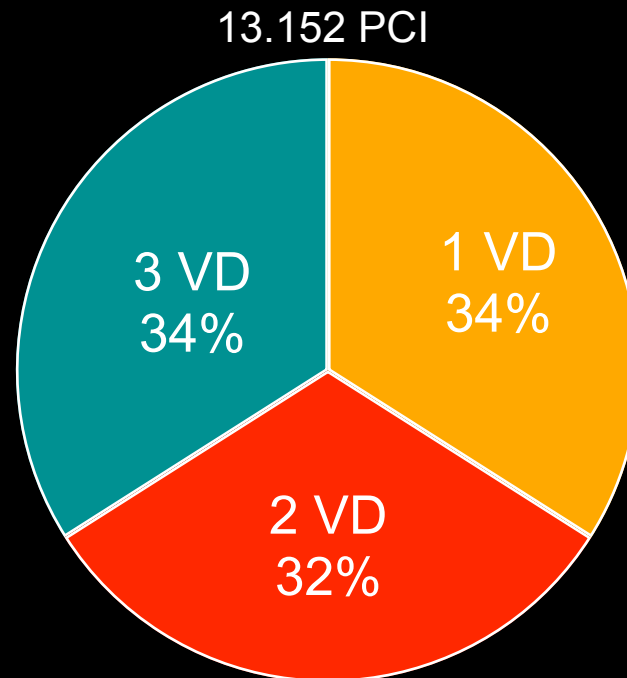
Stable patients with MVD including LAD involvement.

Stable patients with ostial or complex proximal LAD lesion.

Any clinical or angiographic evidence of higher periprocedural risk with *ad hoc* PCI.

Le problème est beaucoup plus complexe chez le pluritronculaire...

défini par la présence de lésions >50% à l'angiographie sur au moins deux axes majeurs (IVA, Cx, CD ou leurs branches principales) et/ou par une atteinte significative du tronc commun.

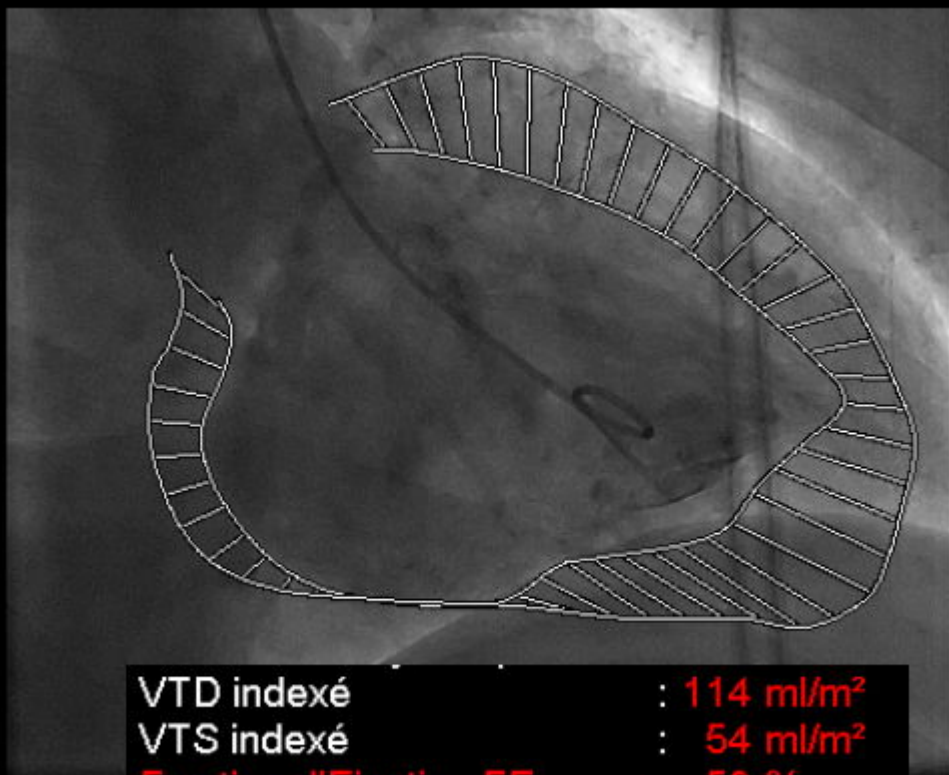


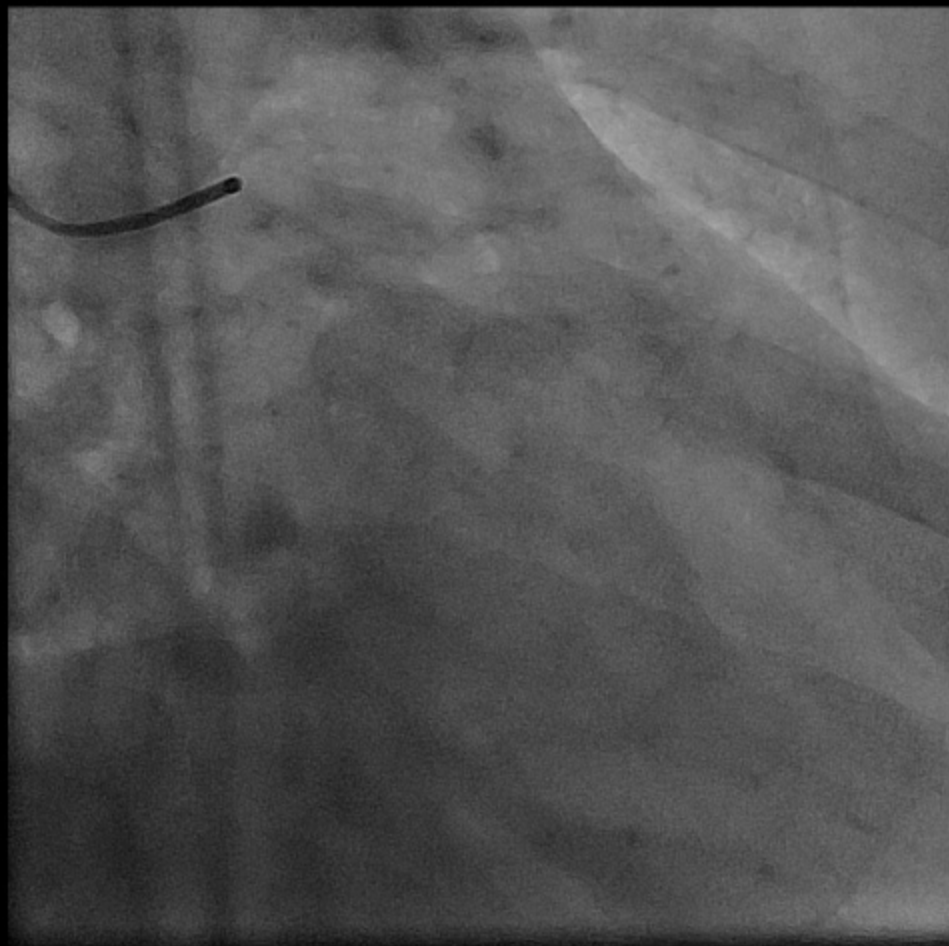
Euro Heart Survey on PCI

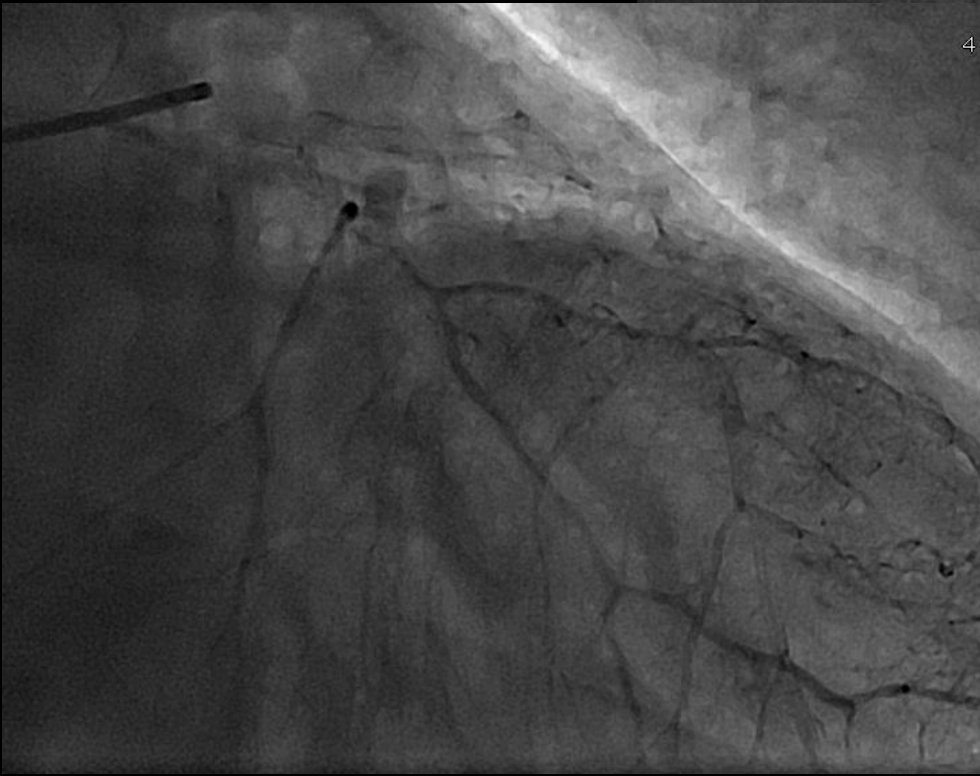
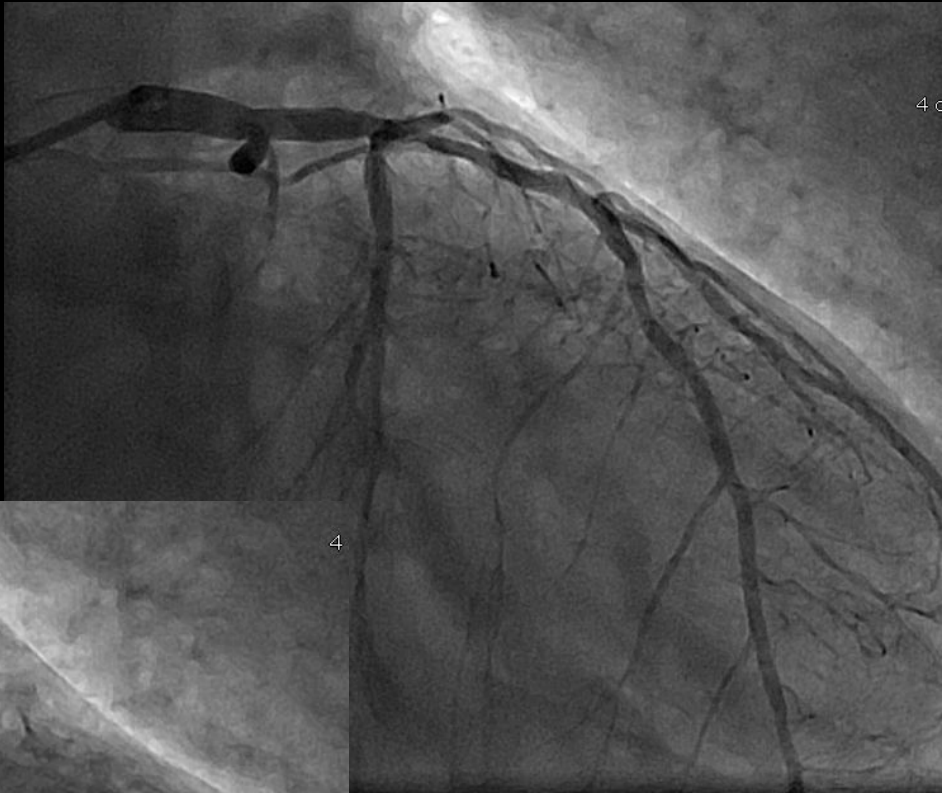
Mr M... 56 ans

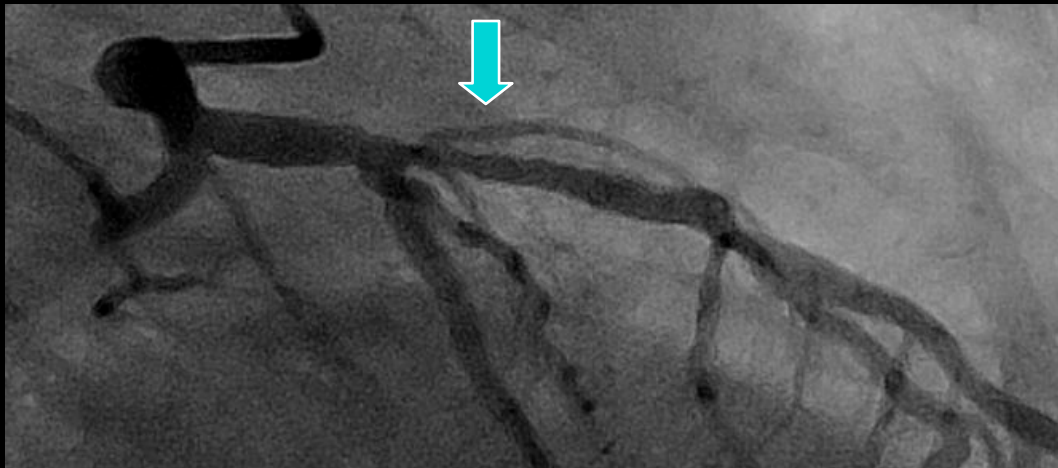
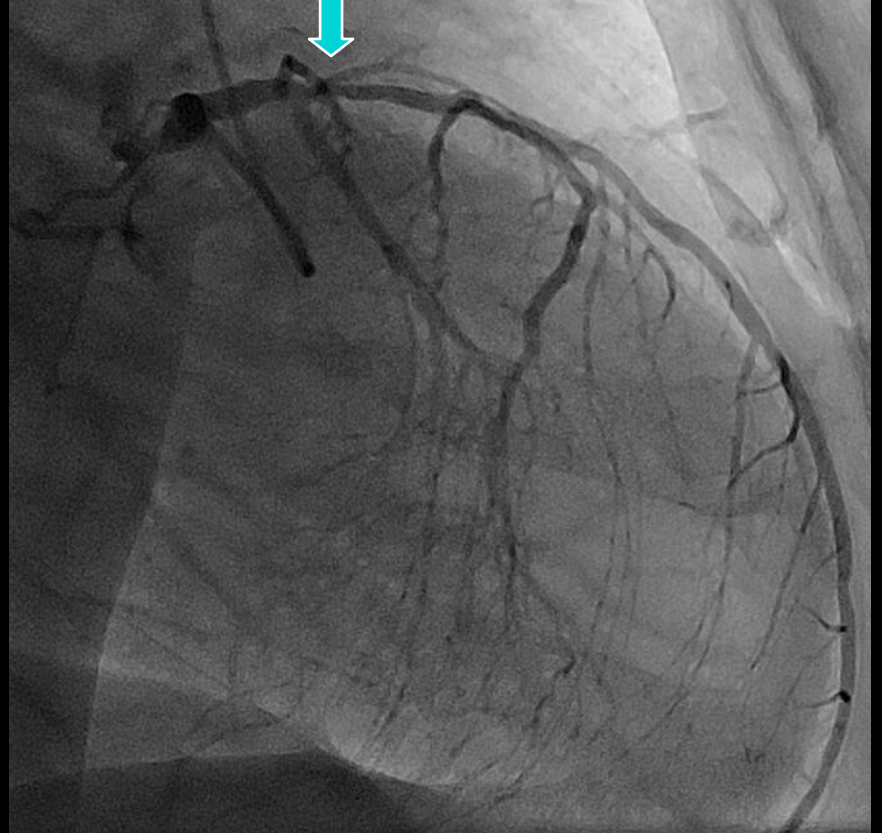
- tabagique et dyslipidémique.
- Aucune symptomatologie cardiaque
- Claudication du membre inférieur droit avec un périmètre entre 200 et 300 mètres
- Bilan angiologique concluant à un petit anévrisme de l'aorte terminale de 38mm de diamètre, partiellement thrombosé avec lésion irrégulière calcifiée de la fémorale superficielle droite, sténose critique de l'iliaque primitive droite, IPS à 0.33 à droite, sténose serrée de l'iliaque externe gauche, et surcharge de la fémorale superficielle avec un IPS à 0.53 à gauche.

Adressé pour un bilan angiographique complet avant angioplastie éventuelle des axes fémoro-iliaques.





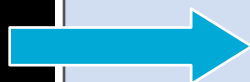




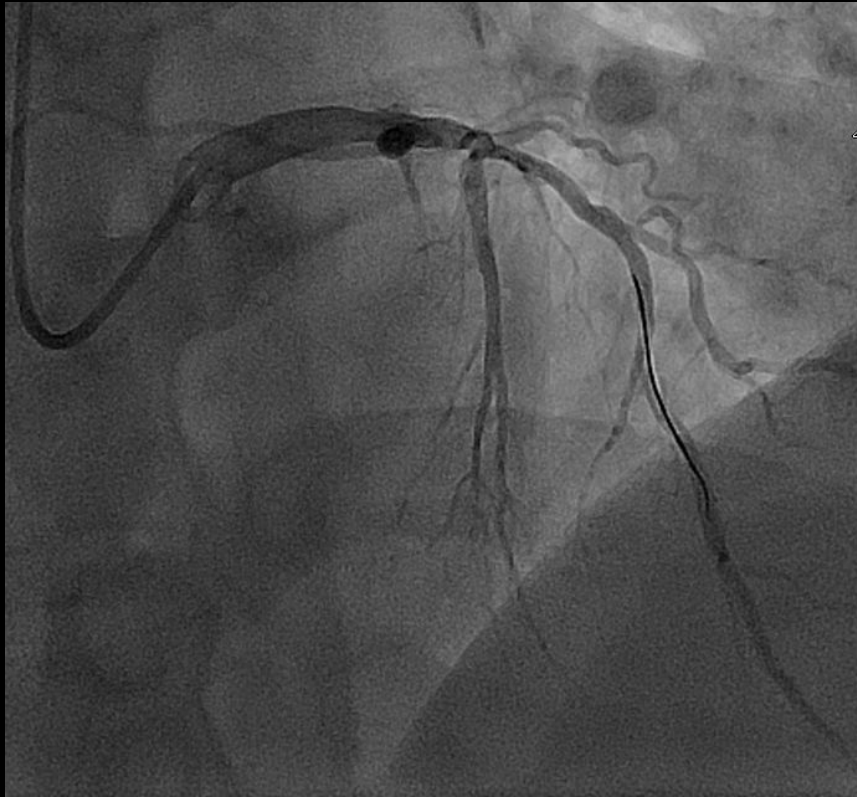


Indications for revascularization in stable angina or silent ischaemia

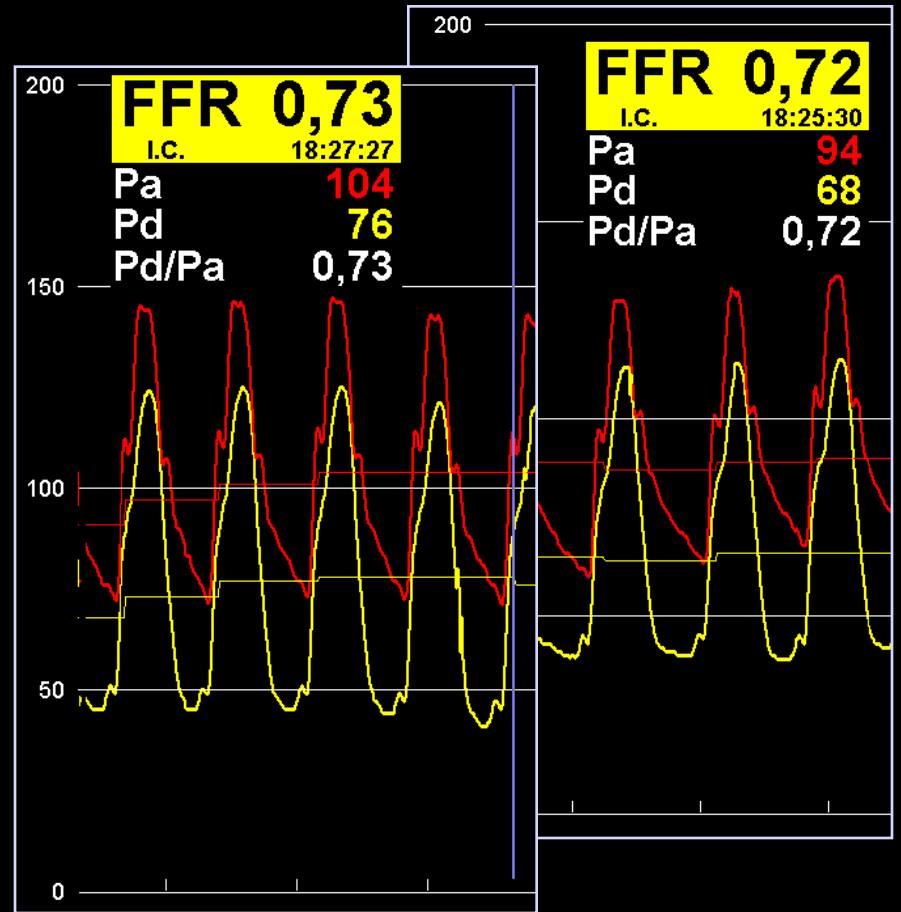
	Subset of CAD by anatomy	Class ^a	Level ^b
For prognosis	Left main >50% ^d	I	A
	Any proximal LAD >50% ^d	I	A
	2VD or 3VD with impaired LV function ^d	I	B
	Proven large area of ischaemia (>10% LV)	I	B
	Single remaining patent vessel >50% stenosis ^d	I	C
	IVD without proximal LAD and without >10% ischaemia	III	A



^d With documented ischaemia or FFR <0.80 for angiographic diameter stenoses 50–90%.



3 pontages (IVA-croix du cœur-MBG)



Indications for coronary artery bypass grafting vs. percutaneous coronary intervention for stable patients with lesions suitable for both procedures and low predicted surgical mortality

Subset of CAD by anatomy	Favours CABG	Favours PCI
3VD complex lesions, incomplete revascularization achievable with PCI, SYNTAX score >22	IA	III A



Recommendations for decision making and patient information

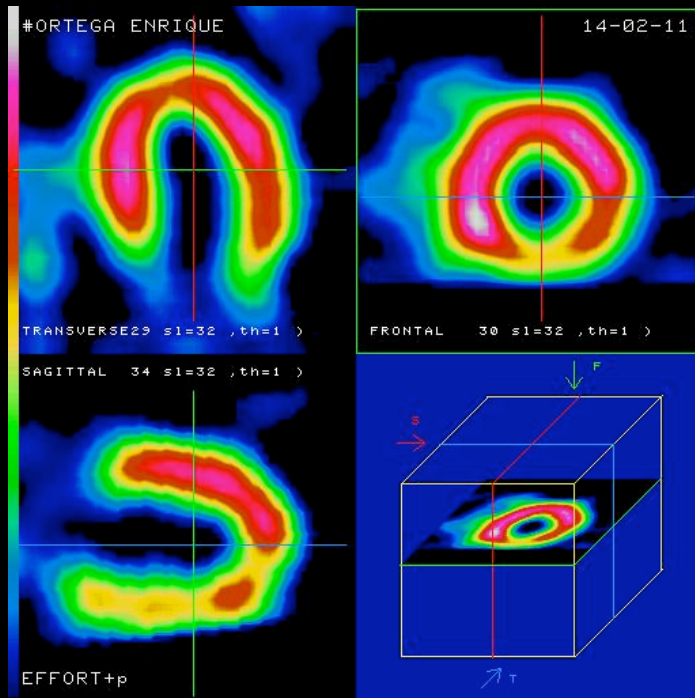
	Class	Level
The appropriate revascularization strategy in patients with MVD should be discussed by the Heart Team.	I	C
It is recommended that patients be adequately informed about the potential benefits and short- and long-term risks of a revascularization procedure. Enough time should be spared for informed decision making.	I	C

Mr O... 73 ans

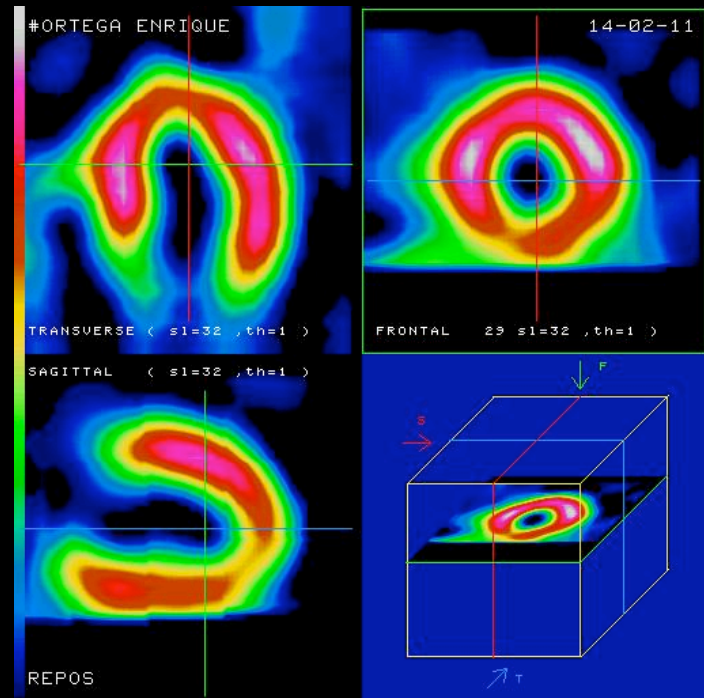
Facteurs de risque : dyslipidémie, diabète de type II, HTA, tabagisme.

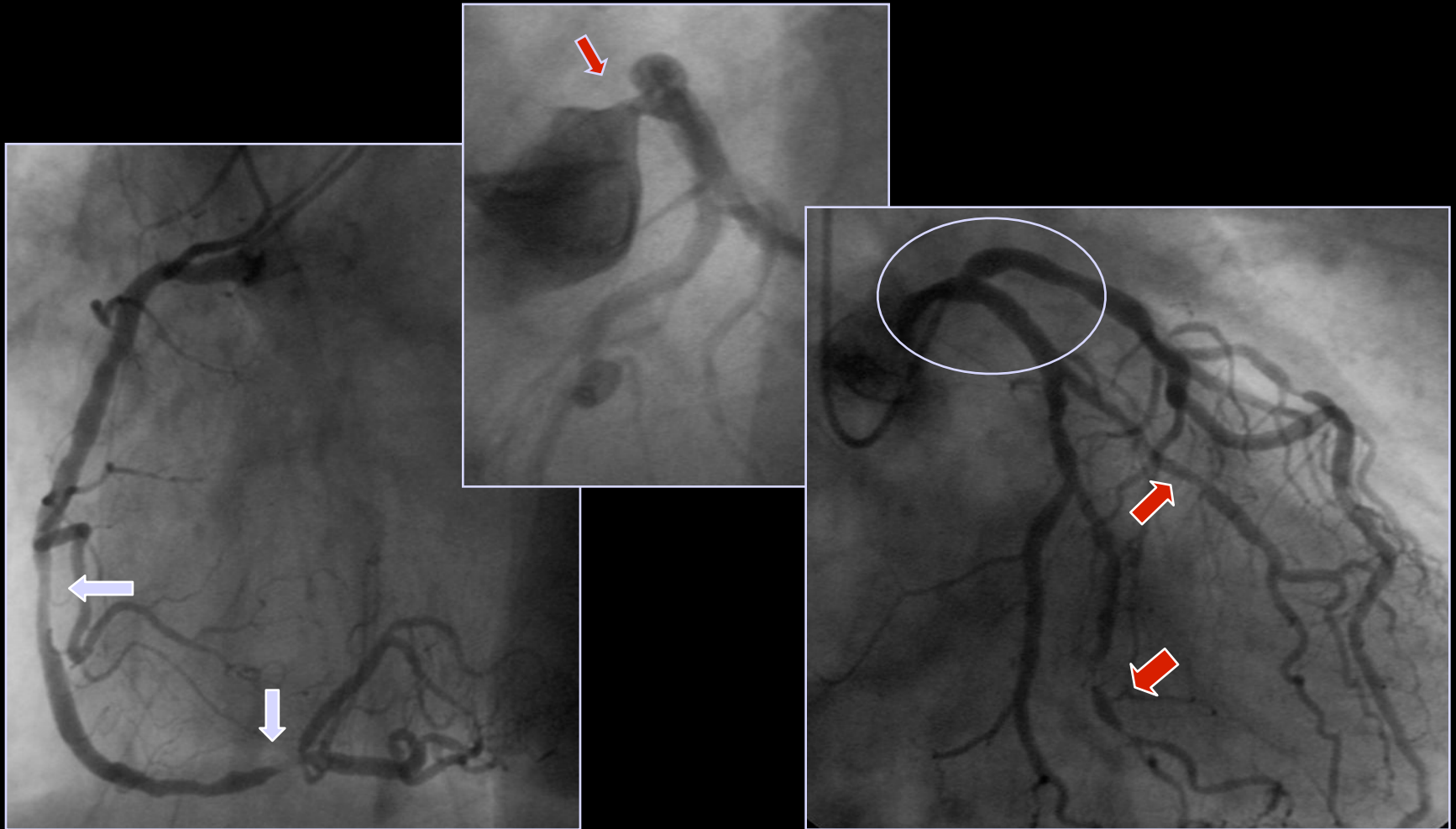
Patient affecté d'une ischémie silencieuse inférieure à la scintigraphie

EFFORT/PERSANTINE

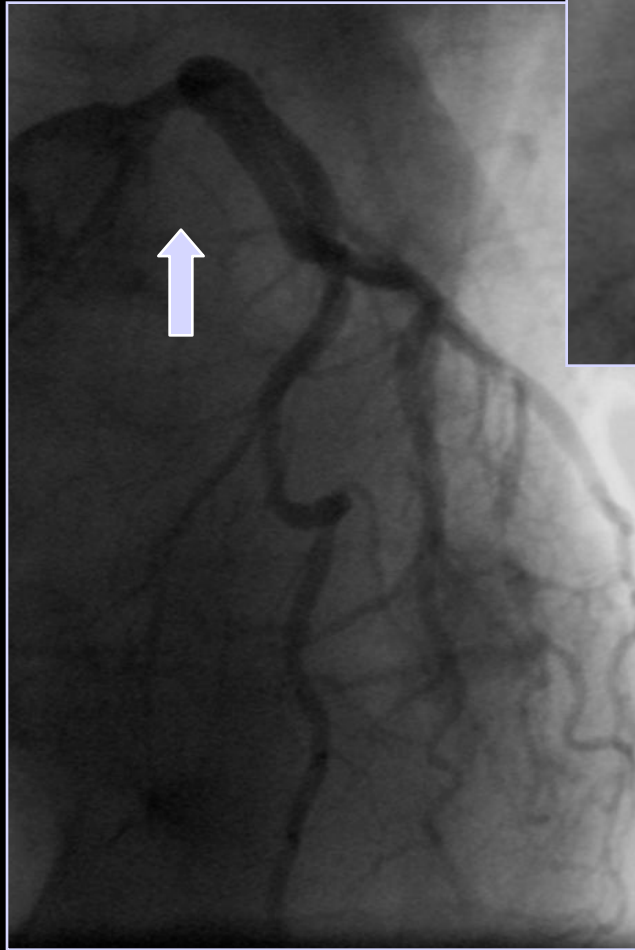


REPOS





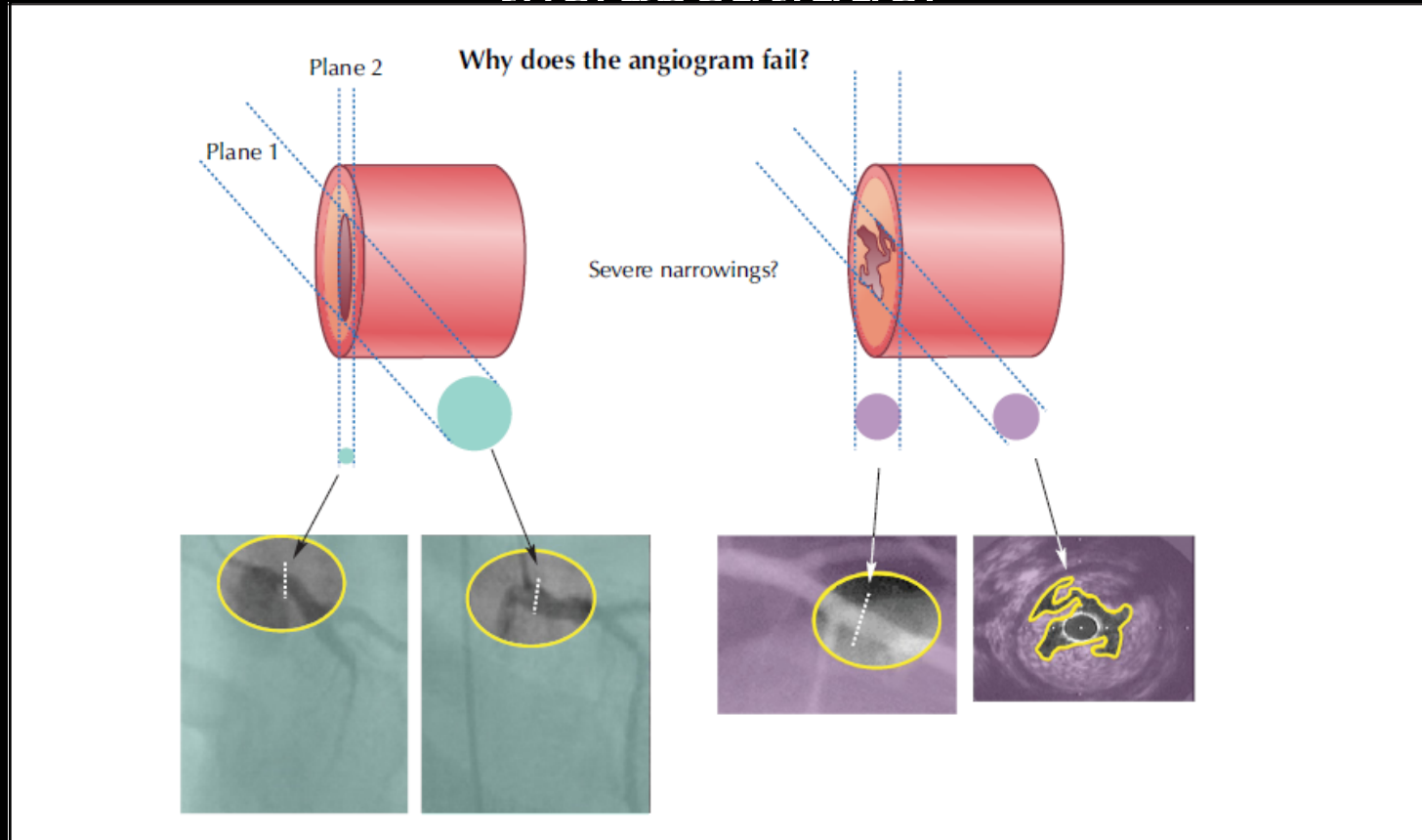
Lésion intermédiaire du tronc et de l'IVA ostiale majorée par un effet mack.
Chapelet de lésions critiques sur la première marginale. Lésions étagées diffuses de la deuxième marginale, anatomiquement grêle.
Sténose critique de la croix du cœur, précédée d'une lésion tubulaire du secteur II.



Que proposer à ce patient ?

- Angioplastie isolée de la droite sur la base de la scintigraphie qui ne montre qu'une ischémie en territoire inférieur
- Pontages car il s'agit d'un tritronculaire affecté de lésions complexes du réseau gauche avec atteinte tronco-ostiale de l'IVA et d'autant qu'il est diabétique
- Angioplastie de l'ensemble des lésions car, techniquement, on sait le faire !

L'angiographie est-il un outil suffisant pour prendre une décision thérapeutique?

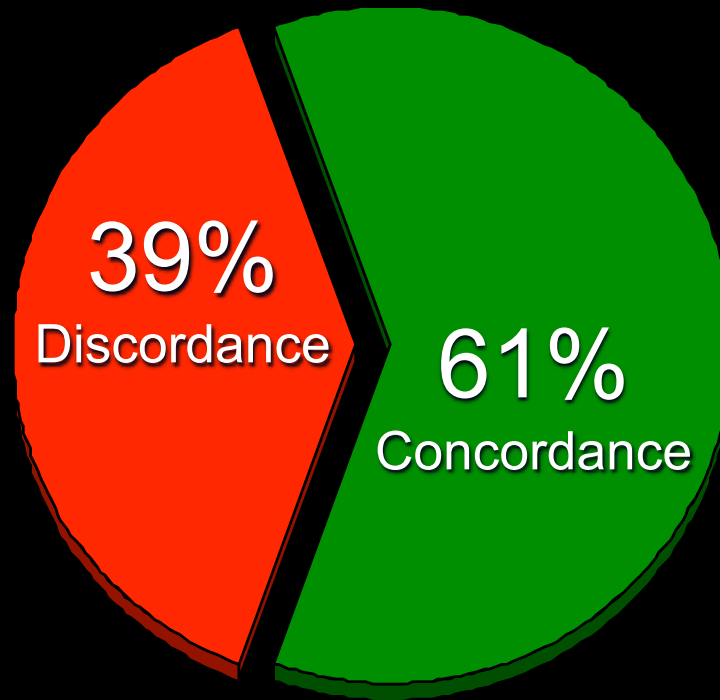


Après avoir bien dégagé la lésion tronco-ostiale de notre patient, l'ambiguïté persiste sur sa sévérité. Peut-on se fier à la scintigraphie qui ne détecte qu'une ischémie post ?

Comparison of MIBI-SPECT and FFR Analysis Per-Patient

N Melikian et al JACC Interv 2010

Patients with MVD (n = 67), vascular territories (n = 201)

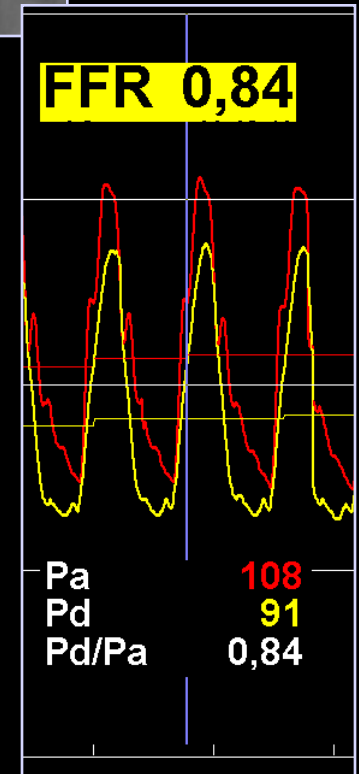
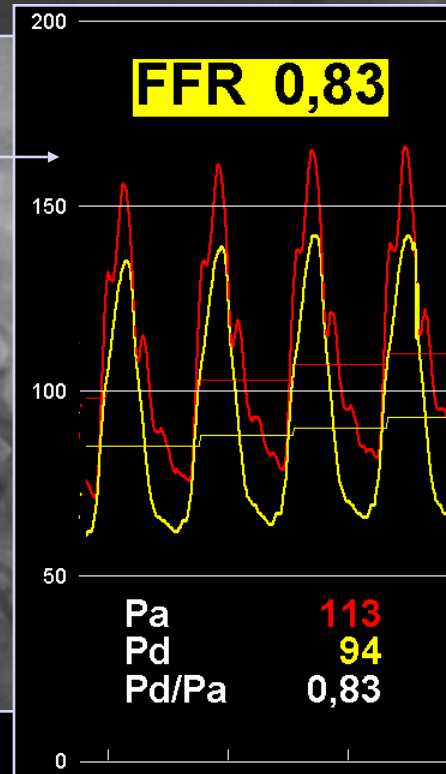
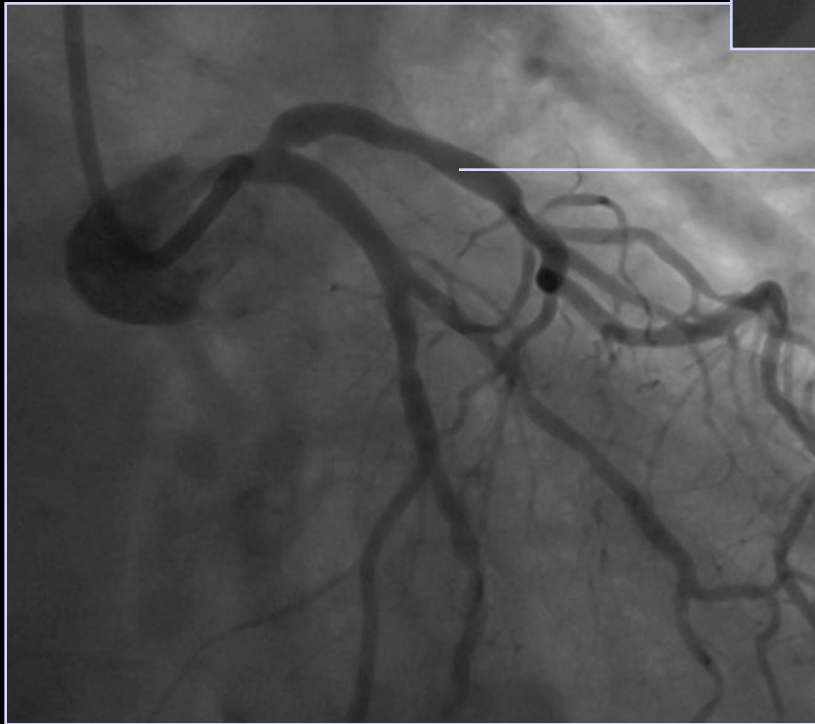
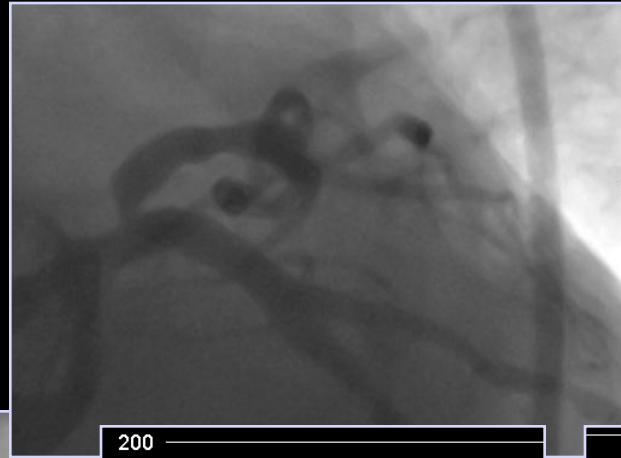
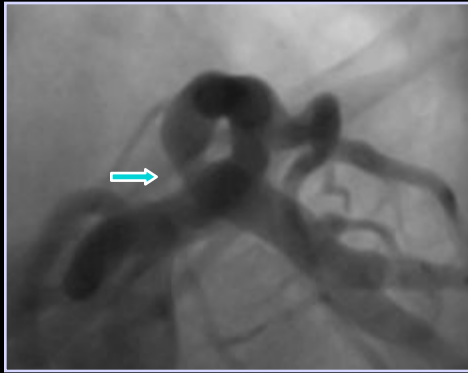


Poor concordance between MIBI SPECT and FFR
[K = 0.14 (95% CI -0.10 to 0.39), level of agreement = 0.61±0.12]

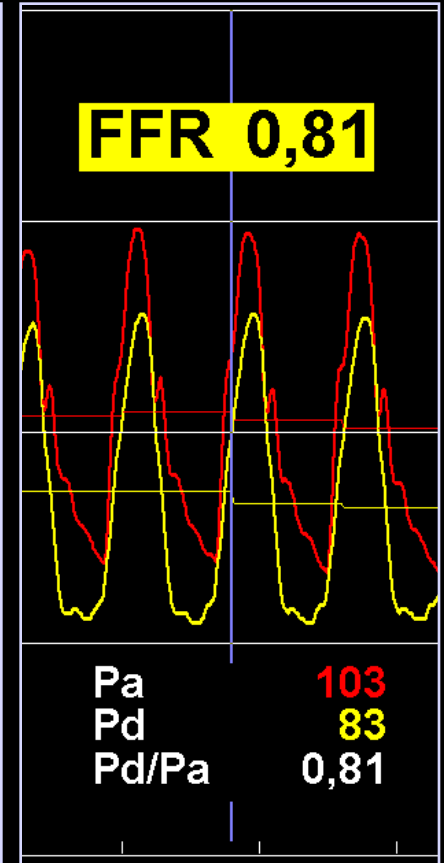
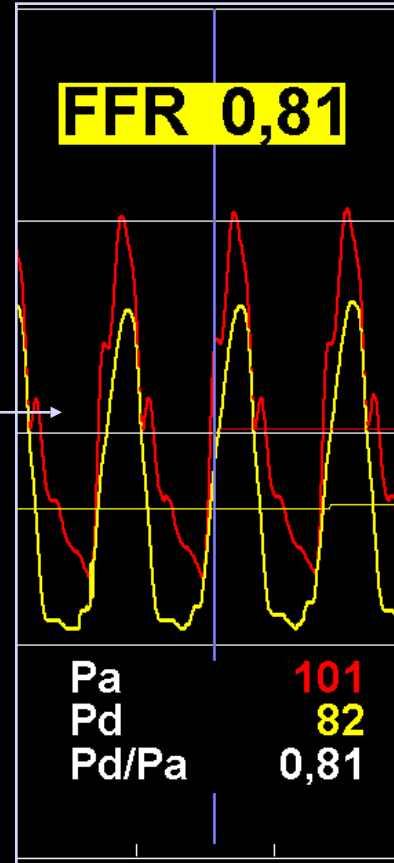
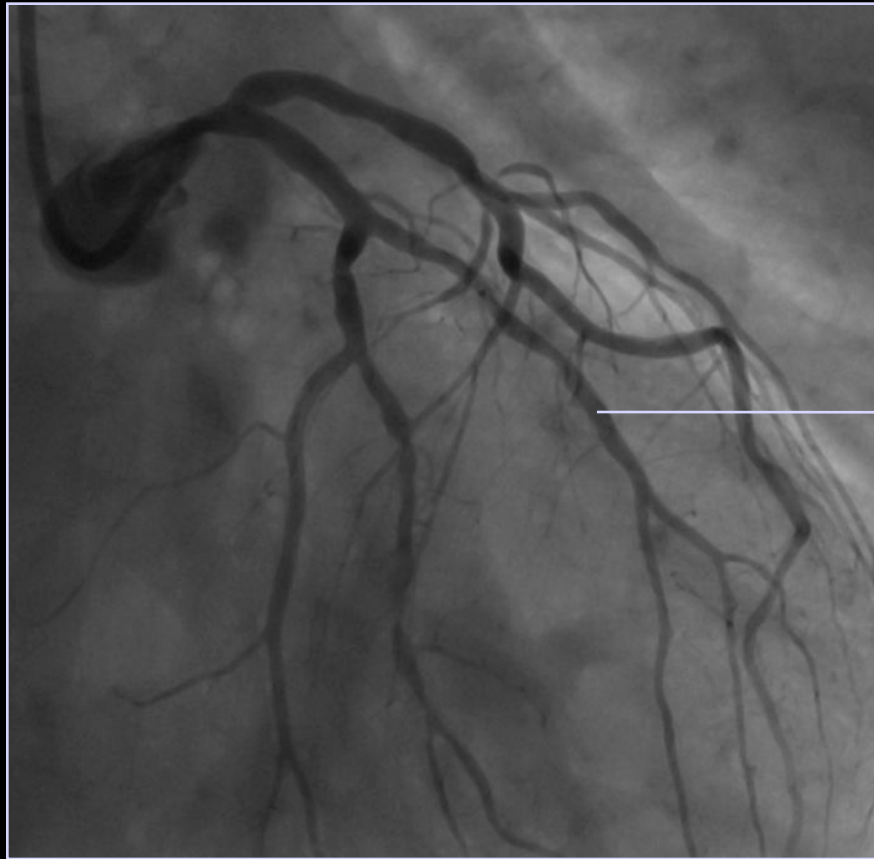


- Culprit coronary stenoses are easily identified by angiography in the vast majority of cases.
- By contrast, in patients with stable CAD and multivessel disease in particular, identification of the culprit stenosis or stenoses requires anatomical orientation by angiography combined with functional evaluation, obtained either by non-invasive imaging before catheterization, or during the invasive procedure using pressure-derived fractional flow reserve (FFR) measurements.

	Class	Level
FFR-guided PCI is recommended for detection of ischaemia-related lesion(s) when objective evidence of vessel-related ischaemia is not available.	I	A



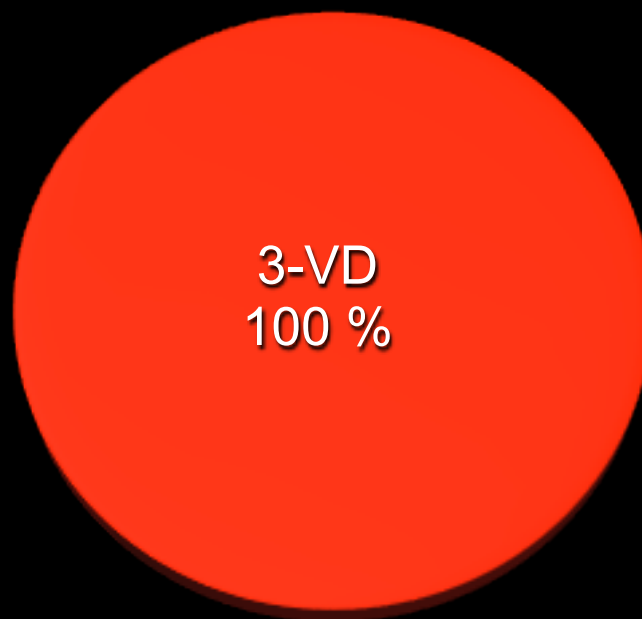
Evaluation de la longue lésion de la 1° marginale du bord gauche





Angiography versus FFR in the FAME study

Proportions of functionally diseased coronary arteries in patients with angiographic 3-vessel disease

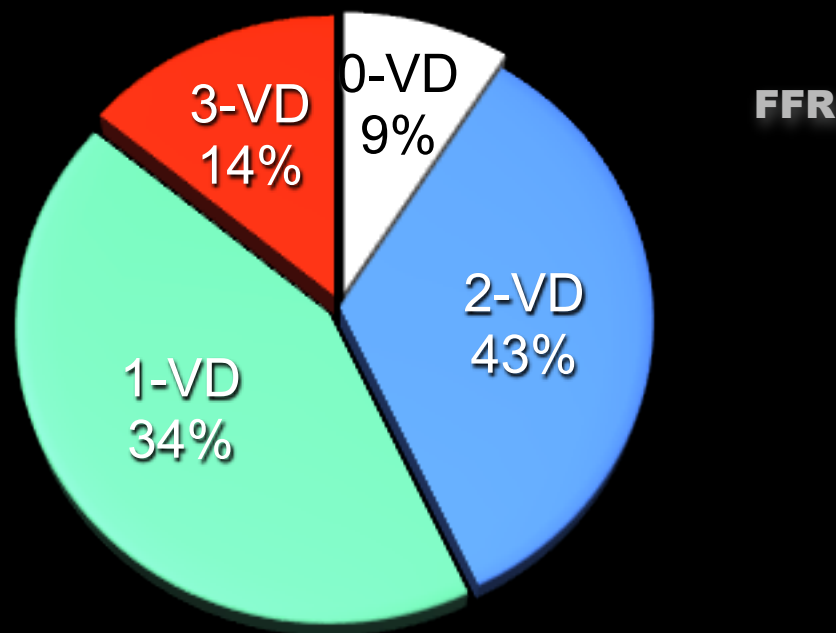


Angiographic Three-VD (n=115)

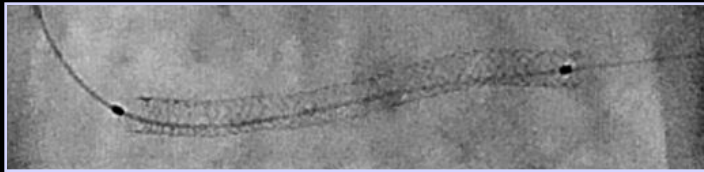
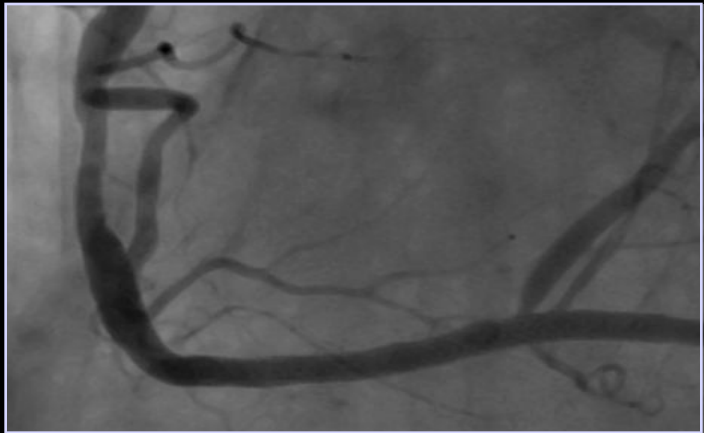
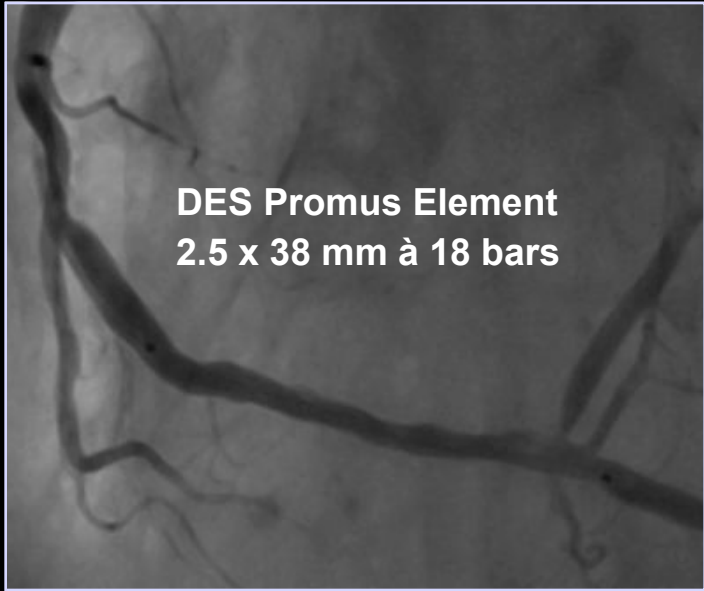
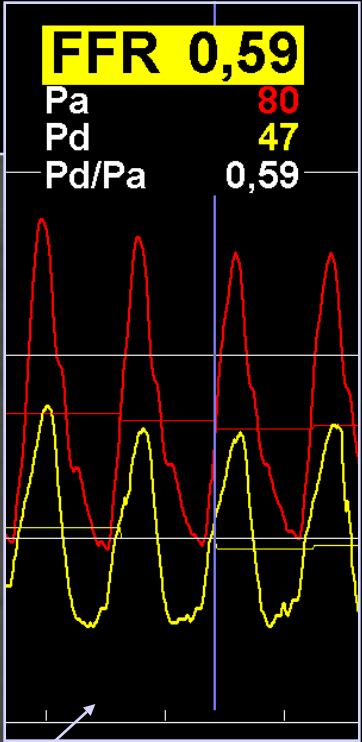


Angiography versus FFR in the FAME study

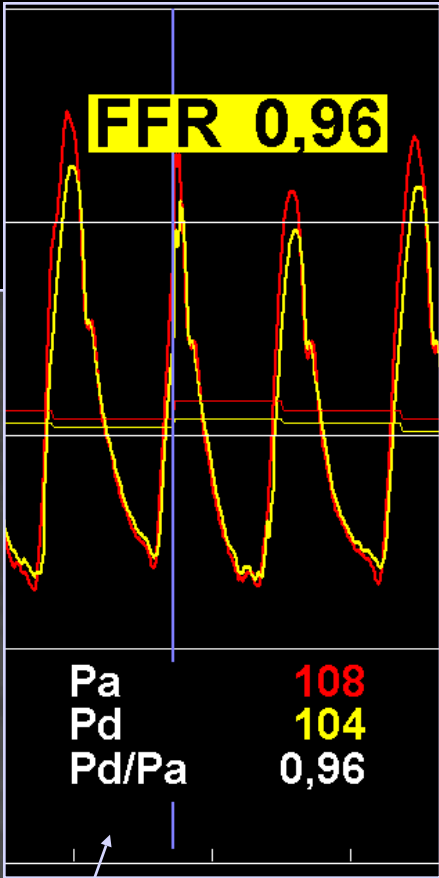
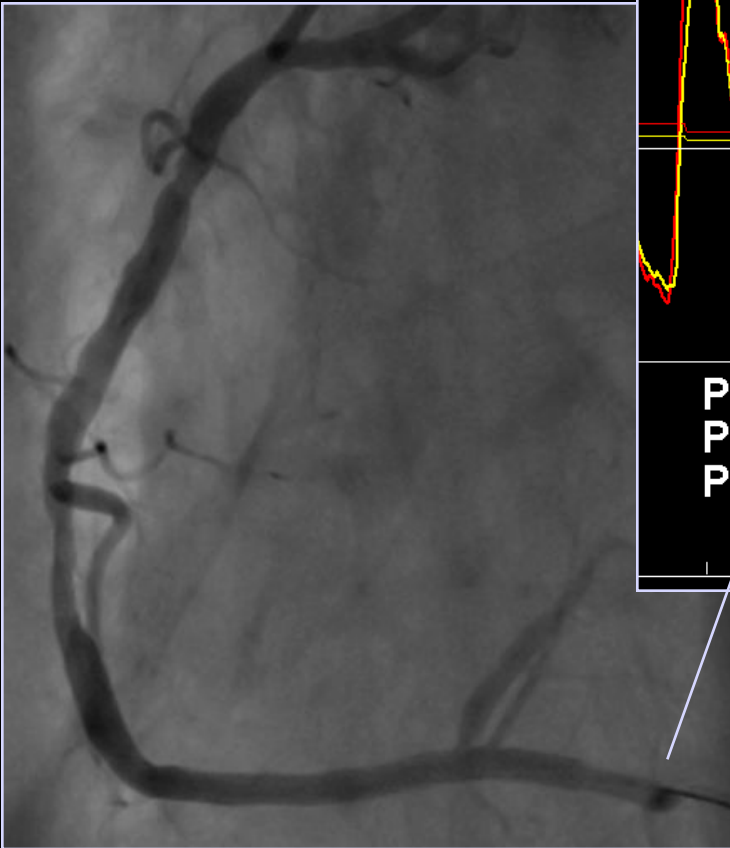
Proportions of functionally diseased coronary arteries in patients with angiographic 3-vessel disease



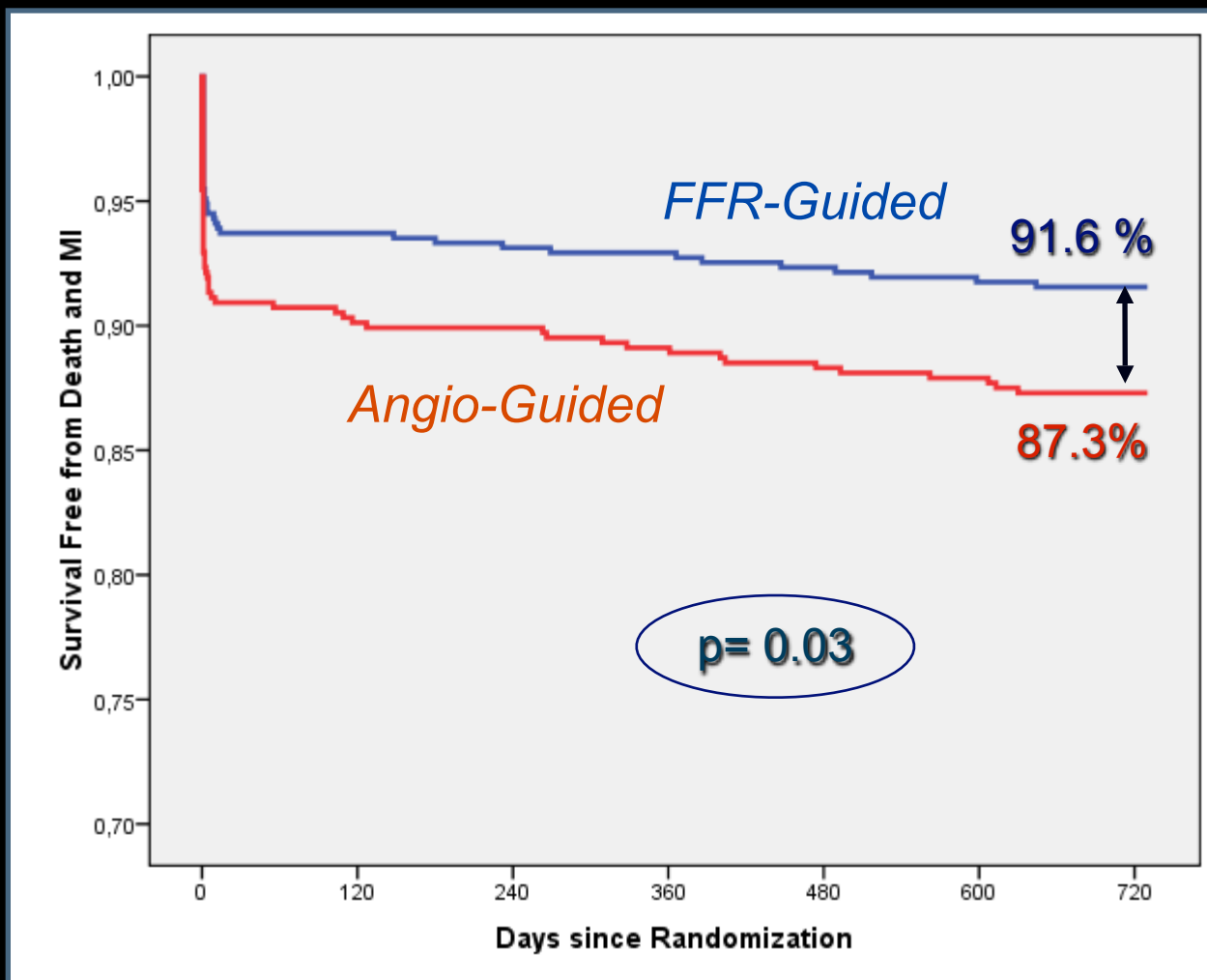
Angiographic Three-VD (n=115)



Faut-il implanter un 2° stent sur le 2° segment ?



2 Year Survival Free of Death/MI

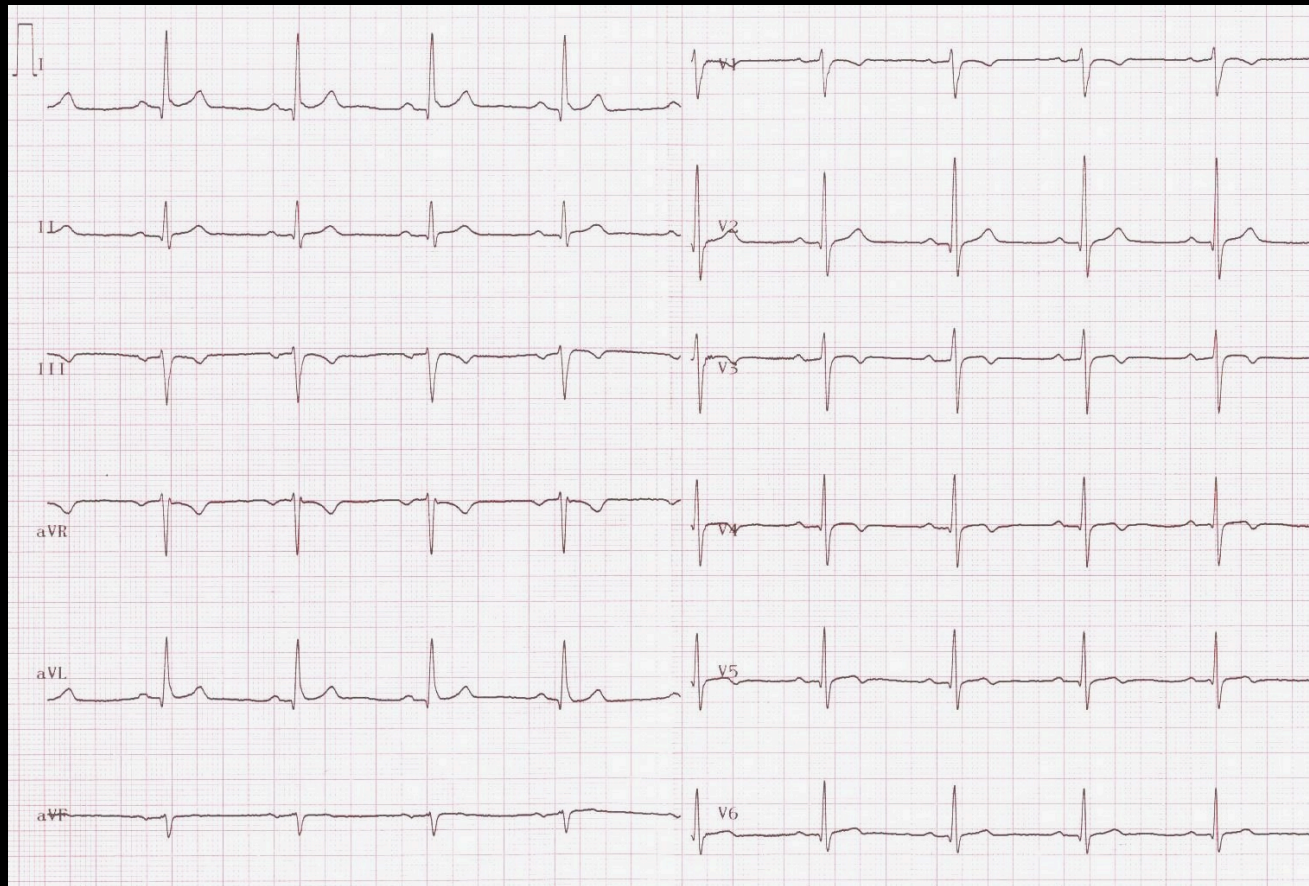


720 days
4.3%

Mr M... 77ans,

retraité très actif, hypertendu et dyslipidémique hospitalisé dans un CHG de la région PACA pour infarctus rudimentaire antérieur avec menace d'extension

ATCD d'hémoptysies sur amylose pulmonaire connue depuis 2 ans.



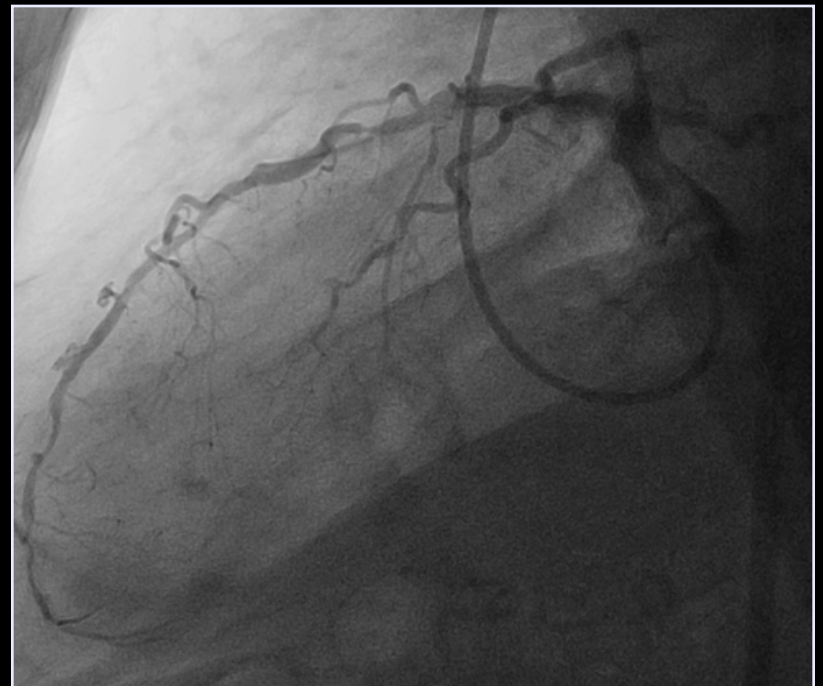
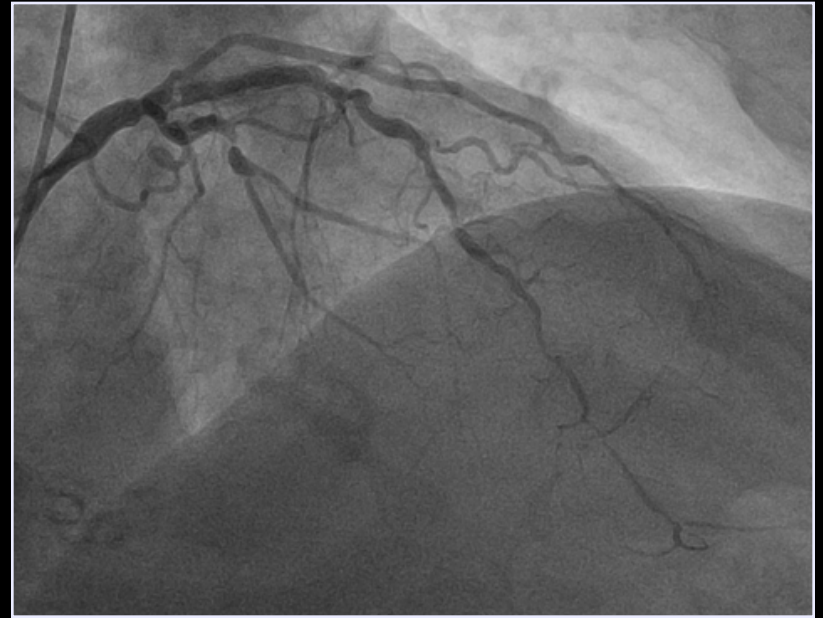
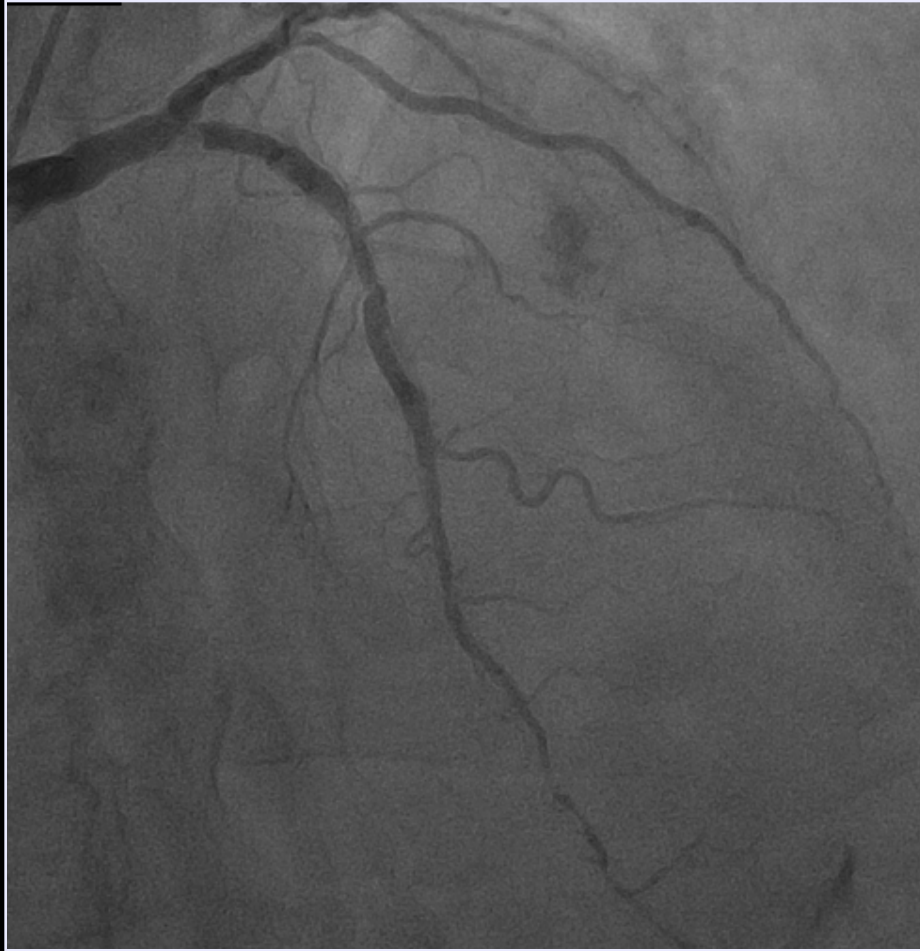
Mr M... 77 ans, Infarctus rudimentaire antérieur avec menace d'extension.

Bon VG à l'échographie

Réseau pétrifié à l'amplificateur de brillance



Mr M... 75 ans ; Nonstemi



transfert à l'Institut pour envisager des pontages...



Indications for coronary artery bypass grafting vs. percutaneous coronary intervention **in stable patients with lesions suitable for both procedures and low predicted surgical mortality**

Subset of CAD by anatomy	Favours CABG	Favours PCI
1VD or 2VD - non-proximal LAD	IIb C	I C
1VD or 2VD - proximal LAD	I A	IIa B
3VD simple lesions, full functional revascularization achievable with PCI, SYNTAX score ≤ 22	I A	IIa B
		III A
		IIa B
		IIb B
		IIb B
Left main + 2VD or 3VD, SYNTAX score ≥ 33	I A	III B

Recommendations for revascularization in non-ST-segment elevation acute coronary syndrome

Specification	Class	Level
An early invasive strategy (<24 h) is indicated in patients with GRACE score >140 or multiple other high-risk criteria.	I	A

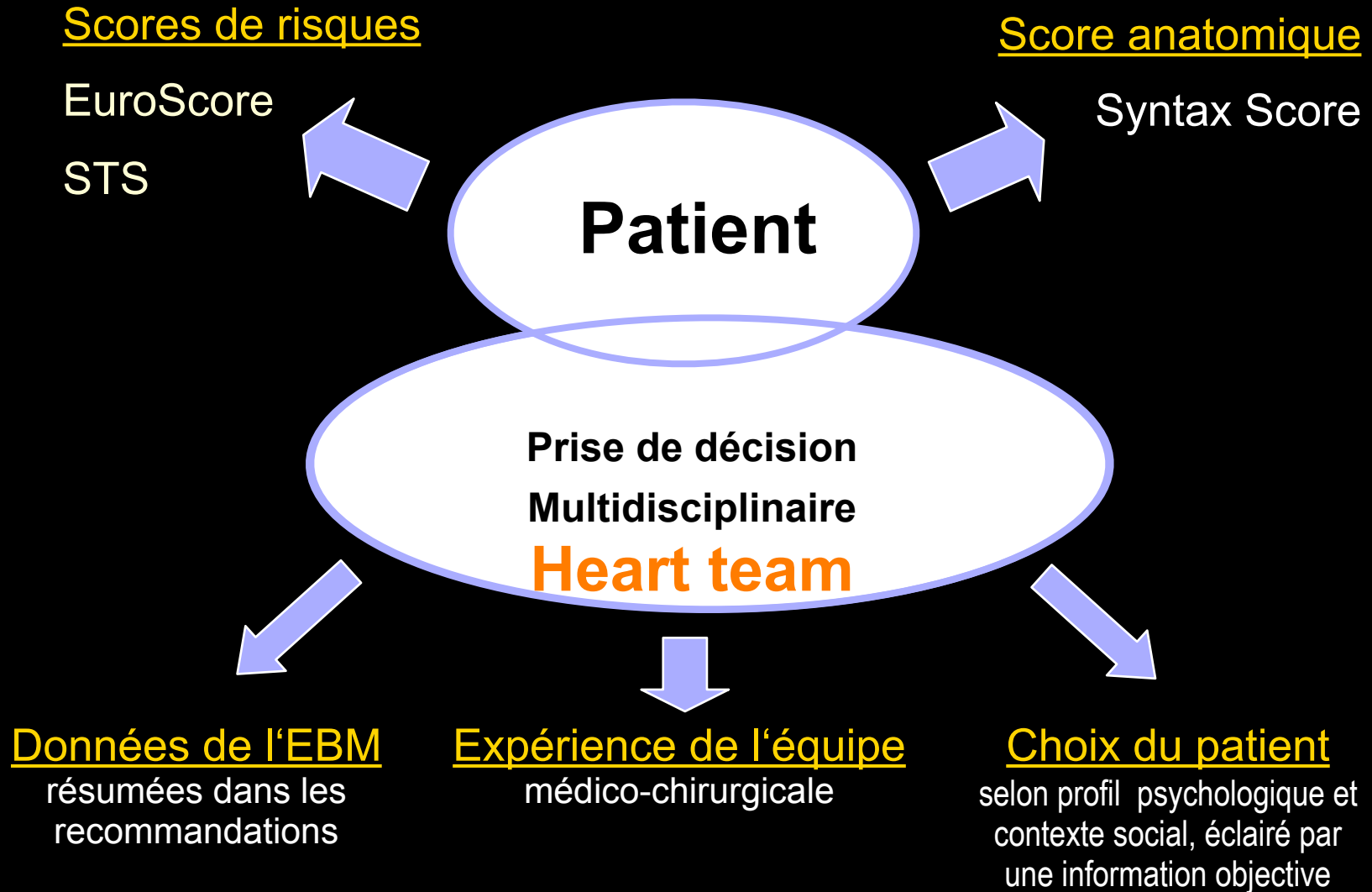


“The Heart team”

Formulation of the best possible revascularization approach, taking into consideration the social and cultural context also, will often require interaction between cardiologists and cardiac surgeons, referring physicians or other specialists as desirable.



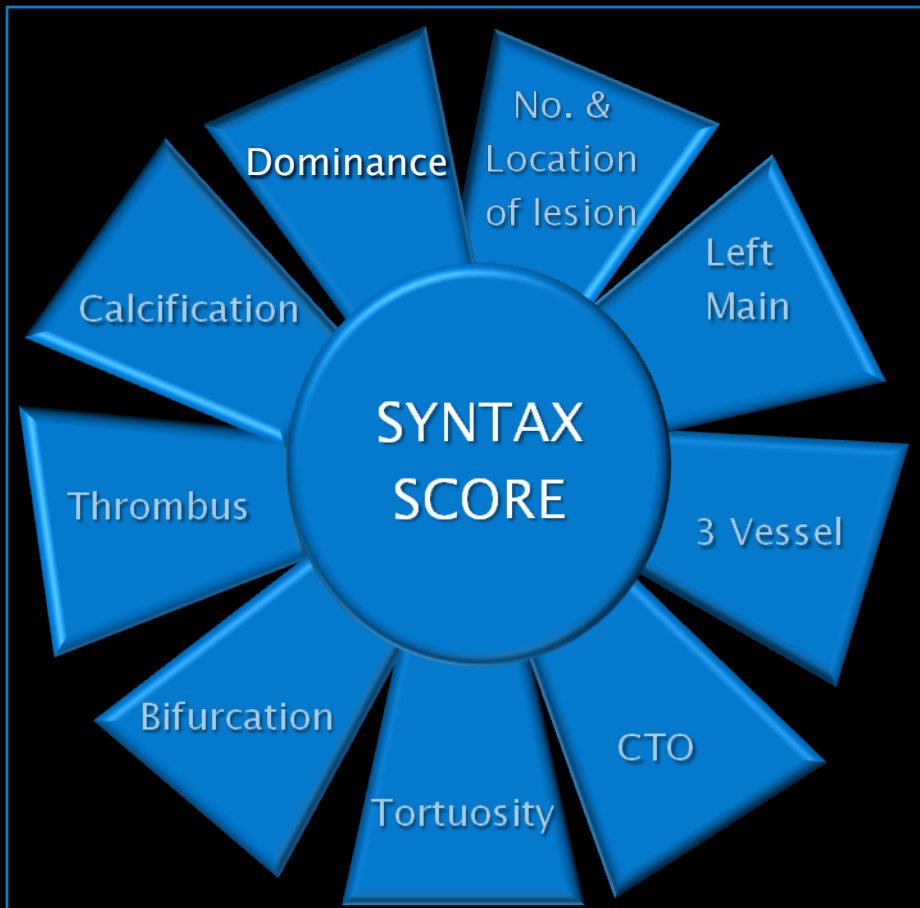
Revascularisation Guidelines ESC 2010



Patient Profiling

Local Heart team (surgeon & interventional cardiologist) assessed each patient in regards to :

- Patient's operative risk (EuroSCORE & Parsonnet score)
- Coronary lesion complexity (Newly developed SYNTAX score)
- Goal: SYNTAX score to provide guidance on optimal revascularization strategies for patients with high risk lesions



Sianos et al, EuroIntervention 2005;1:219-227
Valgimigli et al, Am J Cardiol 2007;99:1072-1081
Serruys et al, EuroIntervention 2007;3:450-459

BARI classification of coronary segments
Leaman score, Circ 1981;63:285-299
Lesions classification ACC/AHA, Circ 2001;103:3019-3041
Bifurcation classification, CCI 2000;49:274-283
CTO classification, J Am Coll Cardiol 1997;30:649-656



Patient-related factors

Age (years)	<input type="text" value="77"/>	<input type="text" value="4"/>
Gender	<input type="text" value="Female"/>	<input type="text" value="1"/>
Chronic pulmonary disease ¹	<input type="text" value="No"/>	<input type="text" value="0"/>
Extracardiac arteriopathy ²	<input type="text" value="No"/>	<input type="text" value="0"/>
Neurological dysfunction ³	<input type="text" value="No"/>	<input type="text" value="0"/>
Previous Cardiac Surgery	<input type="text" value="No"/>	<input type="text" value="0"/>
Creatinine > 200 µmol/ L	<input type="text" value="No"/>	<input type="text" value="0"/>
Active endocarditis ⁴	<input type="text" value="No"/>	<input type="text" value="0"/>
Critical preoperative state ⁵	<input type="text" value="No"/>	<input type="text" value="0"/>

Cardiac-related factors

Unstable angina ⁶	<input type="text" value="Yes"/>	<input type="text" value="2"/>
LV function	<input type="text" value="Select"/>	<input type="text" value="0"/>
Recent MI ⁷	<input type="text" value="Yes"/>	<input type="text" value="2"/>
Pulmonary hypertension ⁸	<input type="text" value="No"/>	<input type="text" value="0"/>

Operation-related factors

Emergency ⁹	<input type="text" value="Yes"/>	<input type="text" value="2"/>
Other than isolated CABG	<input type="text" value="No"/>	<input type="text" value="0"/>
Surgery on thoracic aorta	<input type="text" value="No"/>	<input type="text" value="0"/>
Post infarct septal rupture	<input type="text" value="No"/>	<input type="text" value="0"/>

Standard

11

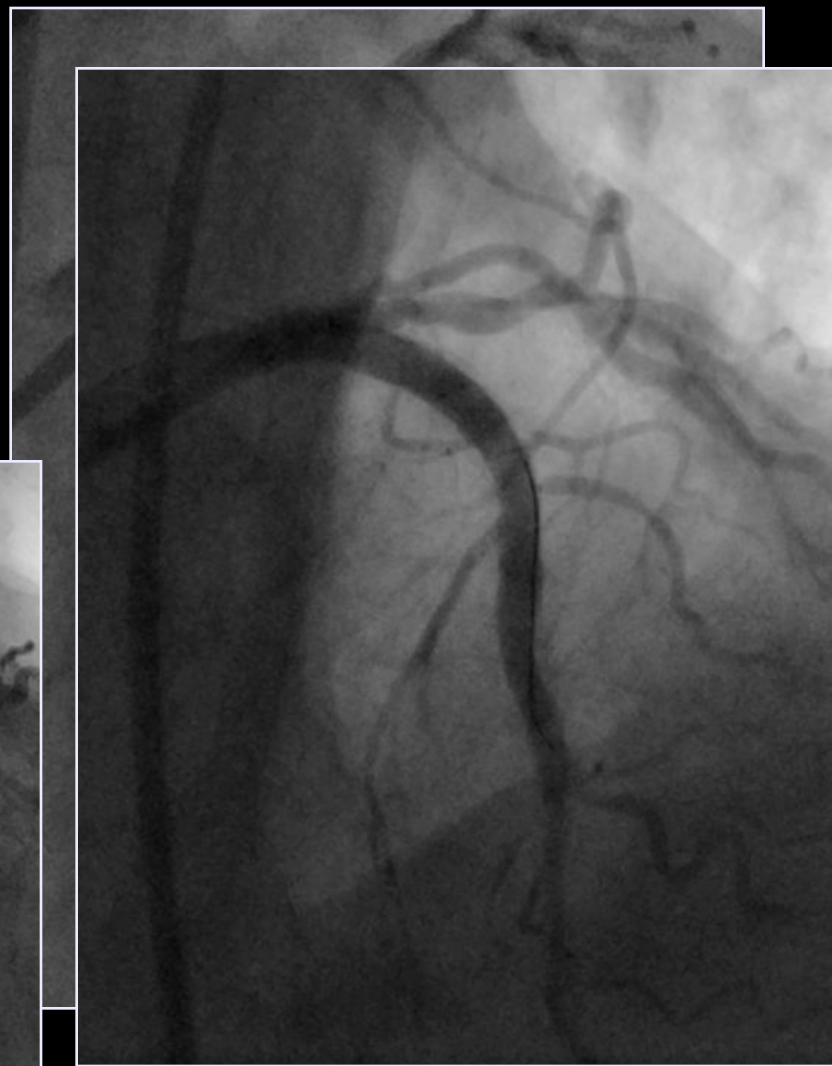


- **Non-emergent highrisk PCI procedures**, including those performed for distal left main disease, complex bifurcation stenosis involving large side branches, single remaining coronary artery, and complex chronic total occlusion recanalization, **should be performed by adequately experienced operators at centres that have access to circulatory support and intensive care treatment, and have cardiovascular surgery on site.**
- The patient should be informed whether all treatment options are available at the site and whether surgery is offered on site or not.

	Class	Level
FFR-guided PCI is recommended for detection of ischaemia-related lesion(s) when objective evidence of vessel-related ischaemia is not available.	I	A
DES are recommended for reduction of restenosis/re-occlusion, if no contraindication to extended DAPT.	I	A
Distal embolic protection is recommended during PCI of SVG disease to avoid distal embolization of debris and prevent MI.	I	B
Rotablation is recommended for preparation of heavily calcified or severely fibrotic lesions that cannot be crossed by a balloon or adequately dilated before planned stenting.	I	C

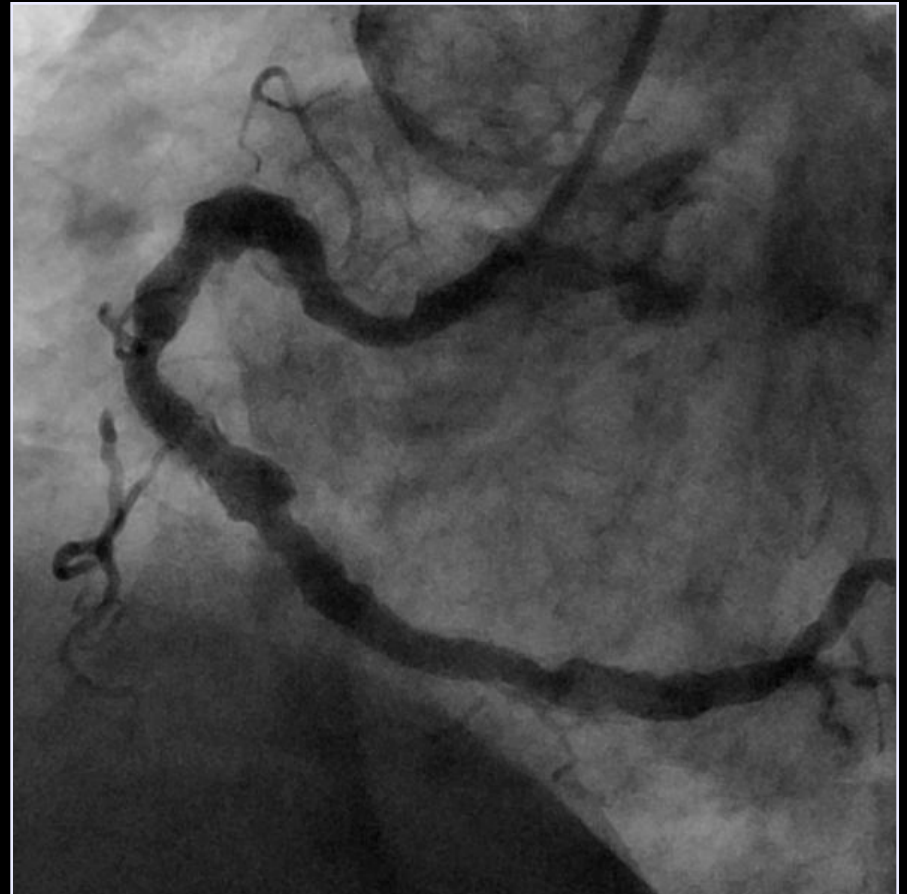
Mr M...

- Rotablator du tronc, de l'IVA proximale et moyenne avec implantation de deux stents Medtronic Integrity longs (3x30 et 3.5x26)



Mr M...

- Rotastent de la coronaire droite moyenne (Cinatra 4.0 x 16 mm à 20B)
- Suites simples ; sortie 48 heures plus tard. Asymptomatique à 2 mois.



Comment optimiser l'angioplastie du pluritronculaire ?

- En sélectionnant de bonnes indications parmi les pluritronculaires
 - utiliser largement le SYNTAX score (OCT à considérer)
 - et les scores d'évaluation du risque opératoire
 - prendre en compte le diabète
 - la faisabilité ne fait pas la bonne l'indication
 - arrêter la décision par concertation multidisciplinaire +++
- En révisant notre stratégie de traitement :
 - Se guider sur l'évaluation des territoires ischémiques +++
 - ne pas traiter avant l'heure des lésions non ischémiantes (FFR)
 - traiter complètement celles qui ont un retentissement
- En améliorant la technique de travail +++
- En utilisant les meilleurs stents (limus, polymères résorbables...)
- En optimisant les traitements anti-plaquettaires
- En adoptant les cibles les plus strictes en prévention secondaire