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JUN 2019

Après FARGO et FUTURE faut-il encore faire de la FFR?

OUI

Brahim Harbaoui, MD, PhD
Hôpital de la Croix Rousse
Hospices Civils de Lyon



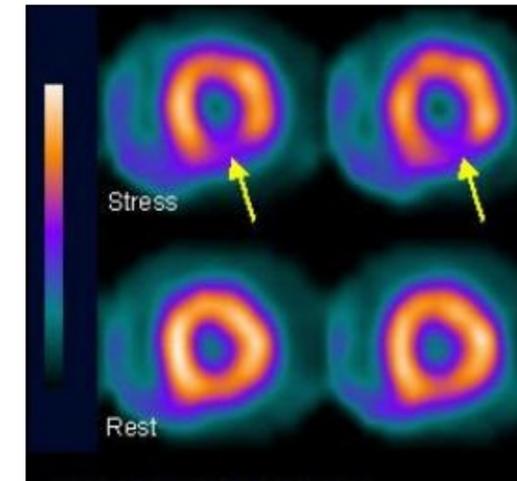
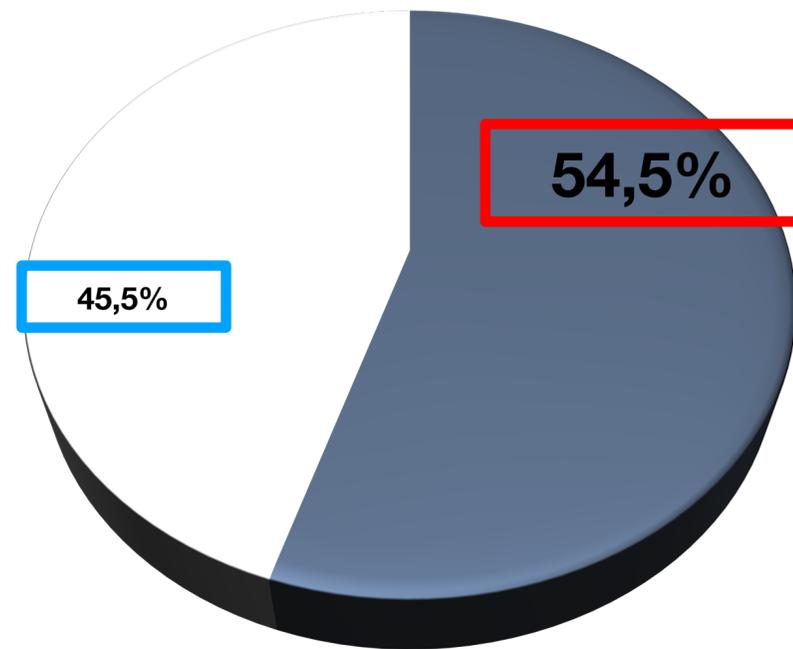
5 6 7
JUN 2019



Pas de conflits d'intérêts

En routine clinique...

Preuve d'ischémie avant coro?



23887 patients (Medicare) 2004

Moins de 50% des patients!

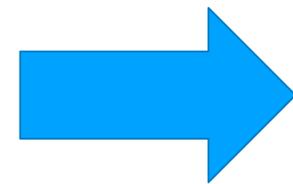
- « sens clinique »...symptômes typiques
- bilan de cardiopathie
- pré-op de chirurgie valvulaire...

Sténose coronaire épigardique

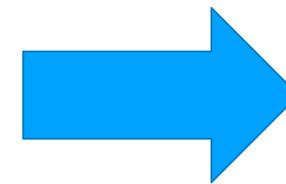
Le scénario idéal



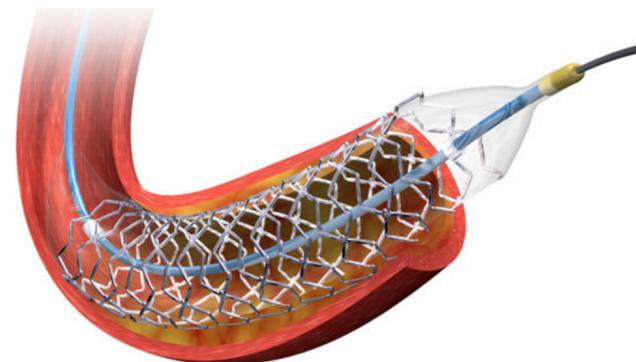
Ischémie



Amélioration
du flux

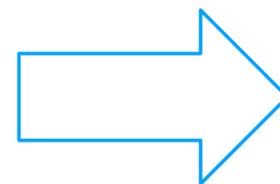
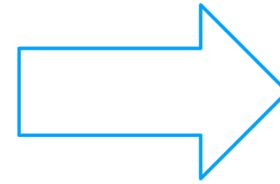
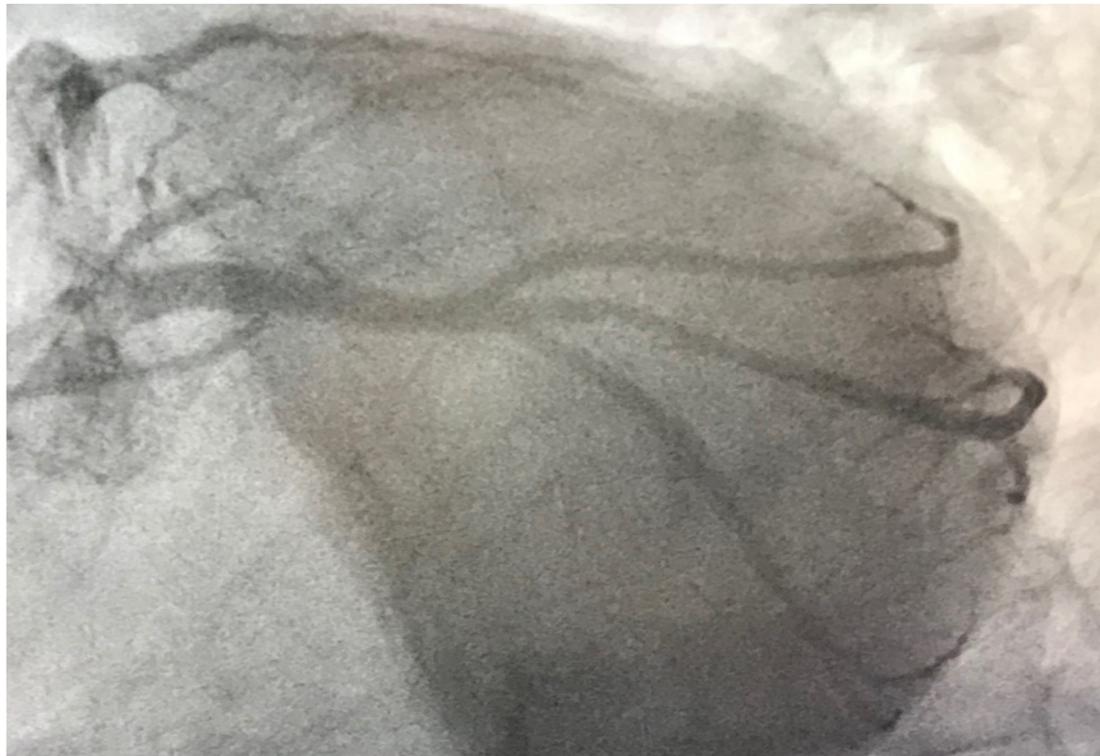


Amélioration
ischémie



Sténose coronaire épicaudique

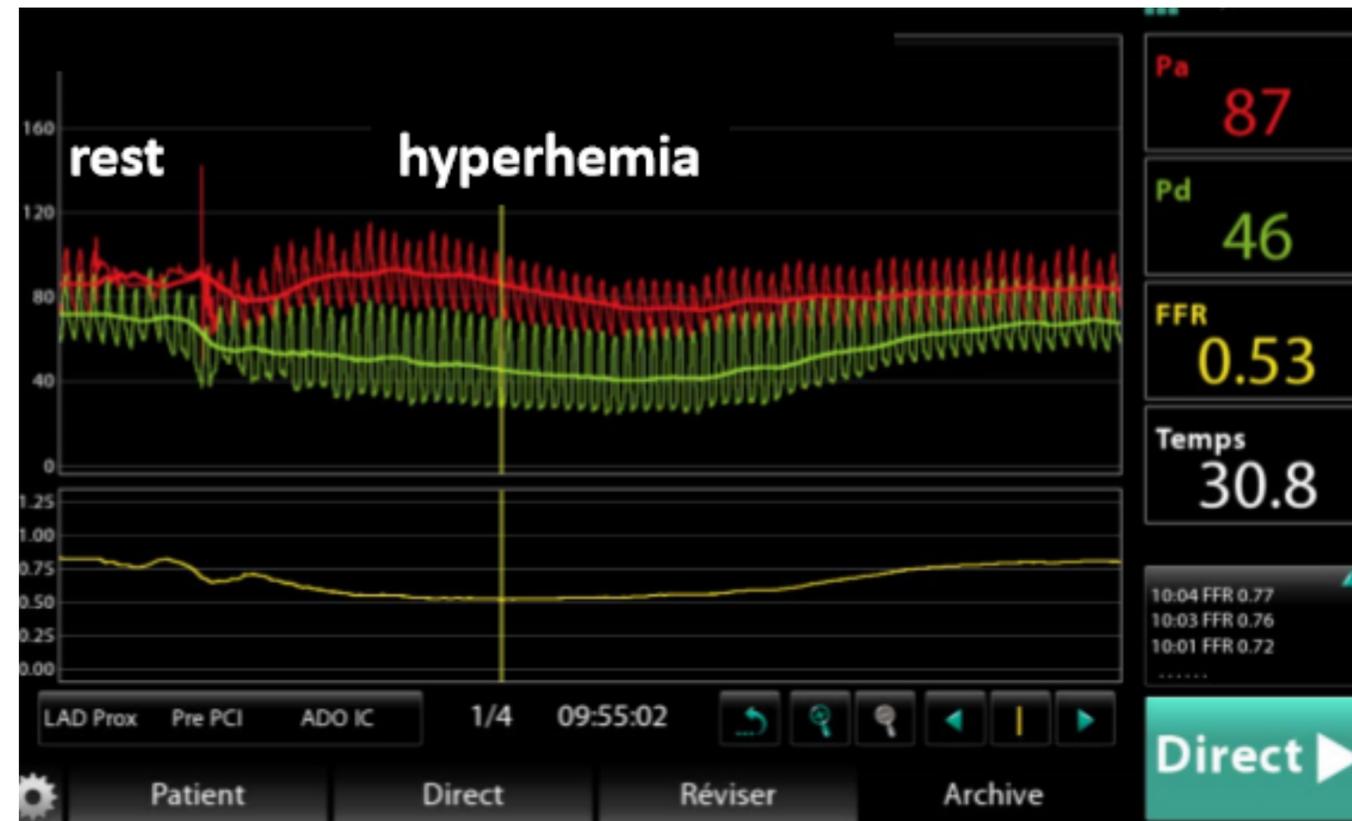
La sténose intermédiaire



FFR

La FFR, un concept simple

Ratio de pression Pd/Pa en hyperhémie pharmacologique



Cut-off $\leq 0,80$

Résistance basse et constante pendant l'hyperhémie

La FFR, des bases solides

Bases scientifiques solides

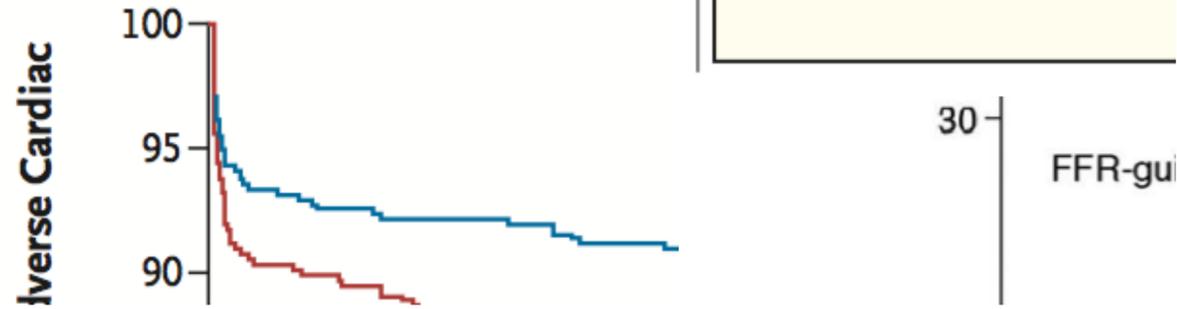
- Essais randomisés
 - Plusieurs milliers de patients
- Registres de vraie vie
 - Maladie coronaire Stable et Aigue
- Follow-up >5ans

La FFR, des bases solides

Outcome Impact of Coronary Revascularization Strategy Reclassification With Fractional Flow Reserve at Time of Diagnostic Angiography

Insights From a Large French Multicenter Fractional Flow Reserve Registry

Eric Van Belle, MD, PhD; Gilles Rioufol, MD, PhD; Christophe Pouillot, MD;
Thomas Cuisset, MD, PhD; Karim Bougrini, MD; Emmanuel Teiger, MD, PhD;
Stéphane Champagne, MD; Loic Belle, MD; Didier Barreau, MD; Michel Hanssen, MD;
Cyril Besnard, MD; Raphael Dauphin, MD; Jean Dallongeville, MD, PhD;
Yassine El Hahi, MSc; Georgios Sideris, MD; Christophe Bretelle, MD; Nicolas Lhoest, MD;
Pierre Barnay, MD; Laurent Leborgne, MD, PhD; Patrick Dupouy, MD;
for the Investigators of the Registre Français de la FFR – R3F

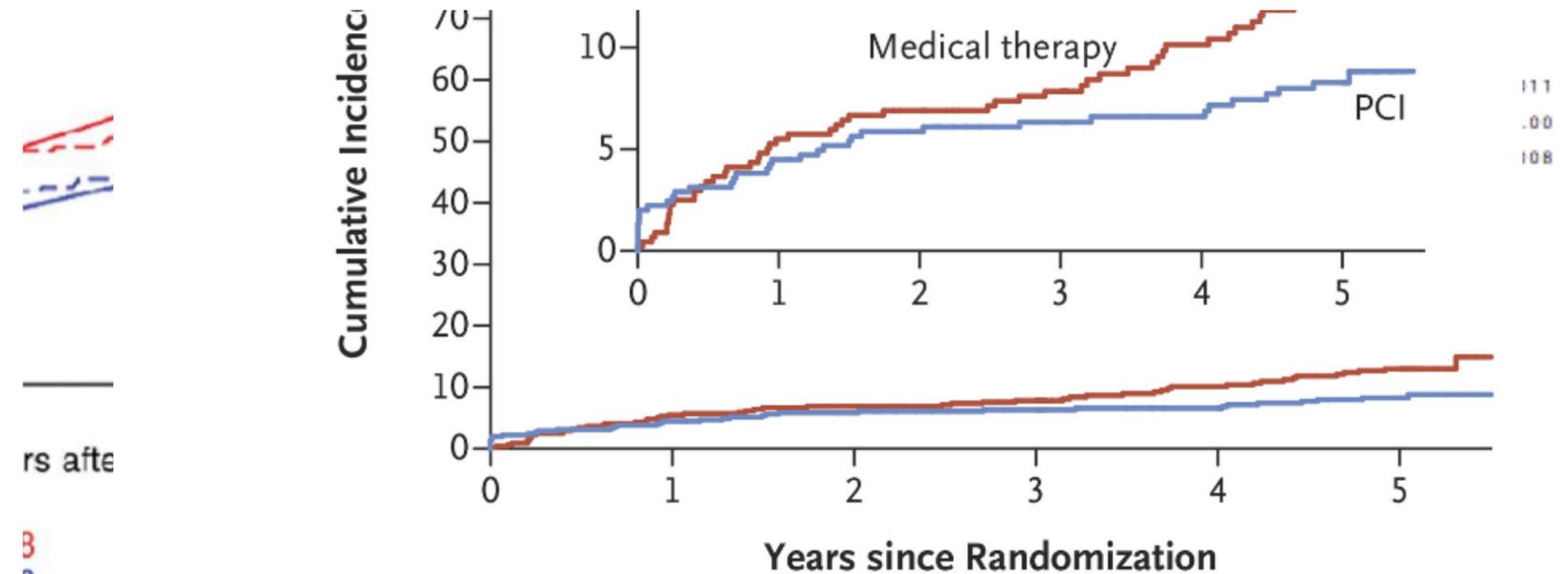


Hazard ratio, 0.46 (95% CI, 0.34–0.63)
P<0.001

Impact of Routine Fractional Flow Reserve on Management Decision and 1-Year Clinical Outcome of Patients With Acute Coronary Syndromes

PRIME-FFR (Insights From the POST-IT [Portuguese Study on the
Evaluation of FFR-Guided Treatment of Coronary Disease] and R3F
[French FFR Registry] Integrated Multicenter Registries - Implementation
of FFR [Fractional Flow Reserve] in Routine Practice)

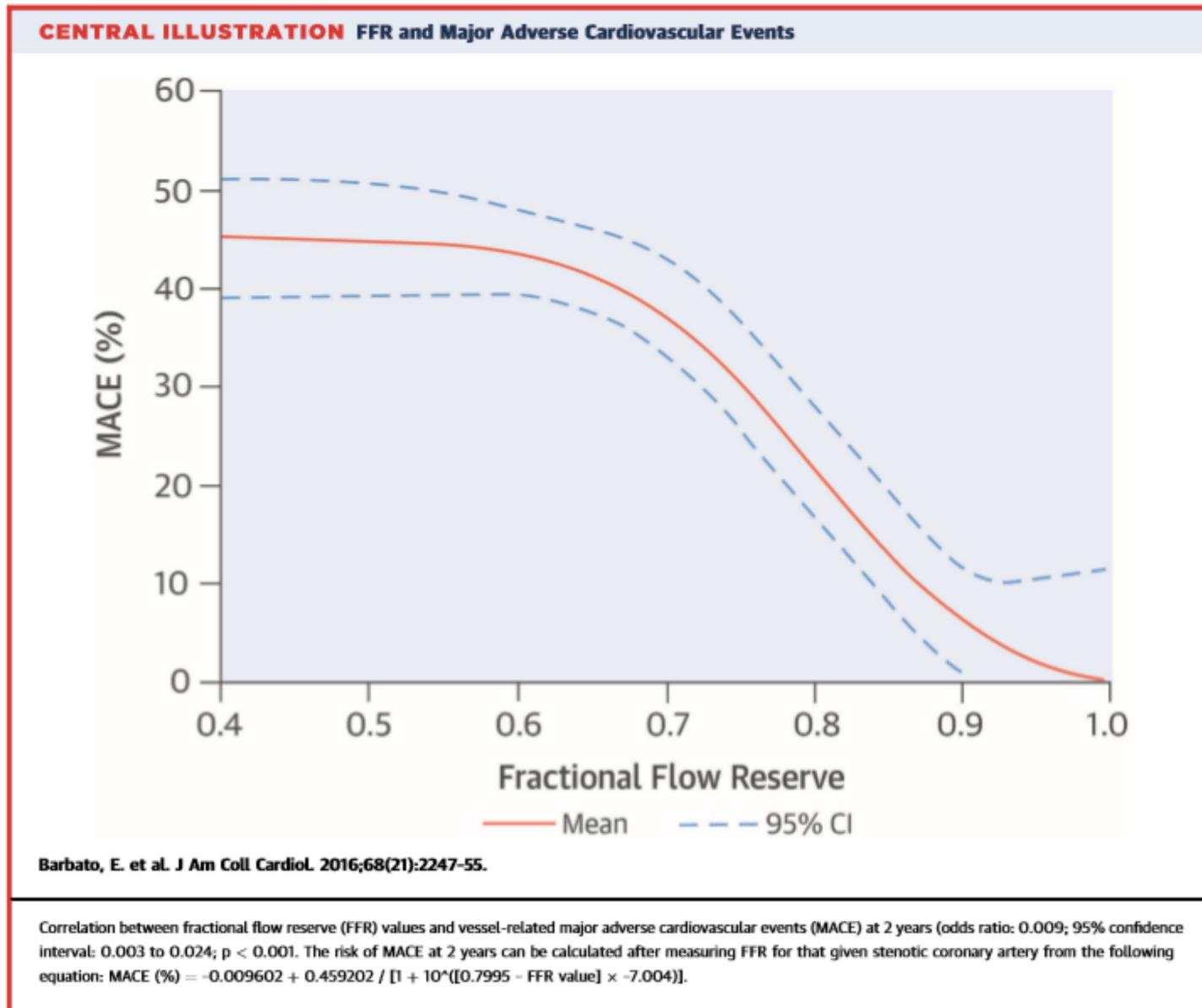
Eric Van Belle, MD, PhD*; Sergio-Bravo Baptista, MD, PhD*; Luís Raposo, MD*;
John Henderson, PhD; Gilles Rioufol, MD, PhD; Lino Santos, MD; Christophe Pouillot, MD;
Ruben Ramos, MD; Thomas Cuisset, MD, PhD; Rita Calé, MD; Emmanuel Teiger, MD, PhD;
Elisabete Jorge, MD, PhD; Loic Belle, MD; Carina Machado, MD; Didier Barreau, MD;
Marco Costa, MD; Michel Hanssen, MD; Eduardo Oliveira, MD; Cyril Besnard, MD; João Costa, MD;
Jean Dallongeville, MD, PhD; João Pipa, MD; Georgios Sideris, MD; Nuno Fonseca, MD;
Christophe Bretelle, MD; Jorge Guardado, MD; Nicolas Lhoest, MD; Bruno Silva, MD;
Pierre Barnay, MD; Maria-João Sousa, MD; Laurent Leborgne, MD, PhD; João Carlos Silva, MD;
Flavien Vincent, MD; Alberto Rodrigues, MD; Luís Seca, MD; Renato Fernandes, MD;
Patrick Dupouy, MD*; for the PRIME-FFR Study Group



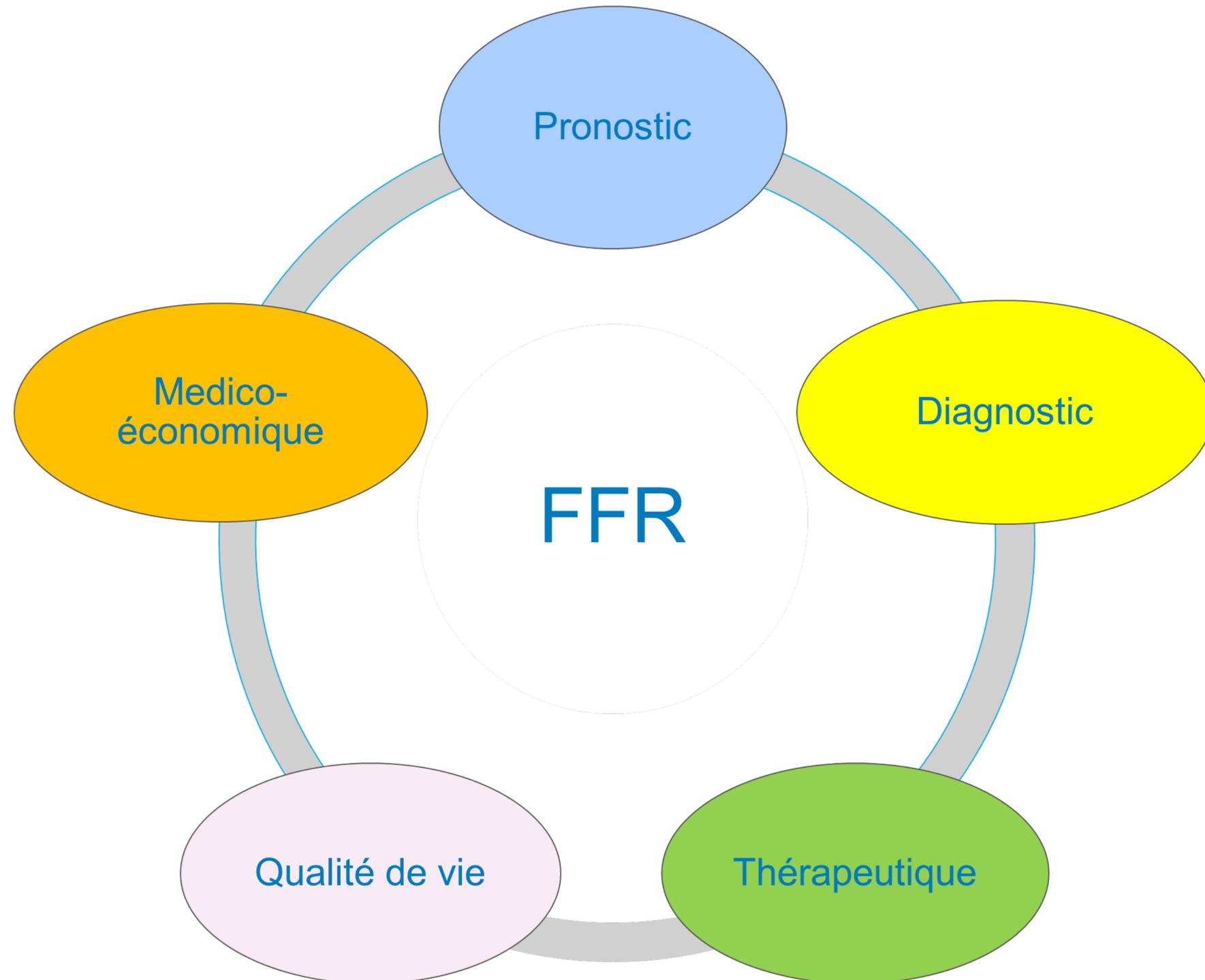
No. at Risk

Medical therapy	441	408	399	387	315	301
PCI	447	421	410	399	340	328

Intérêts de la physiologie coronaire



n=607

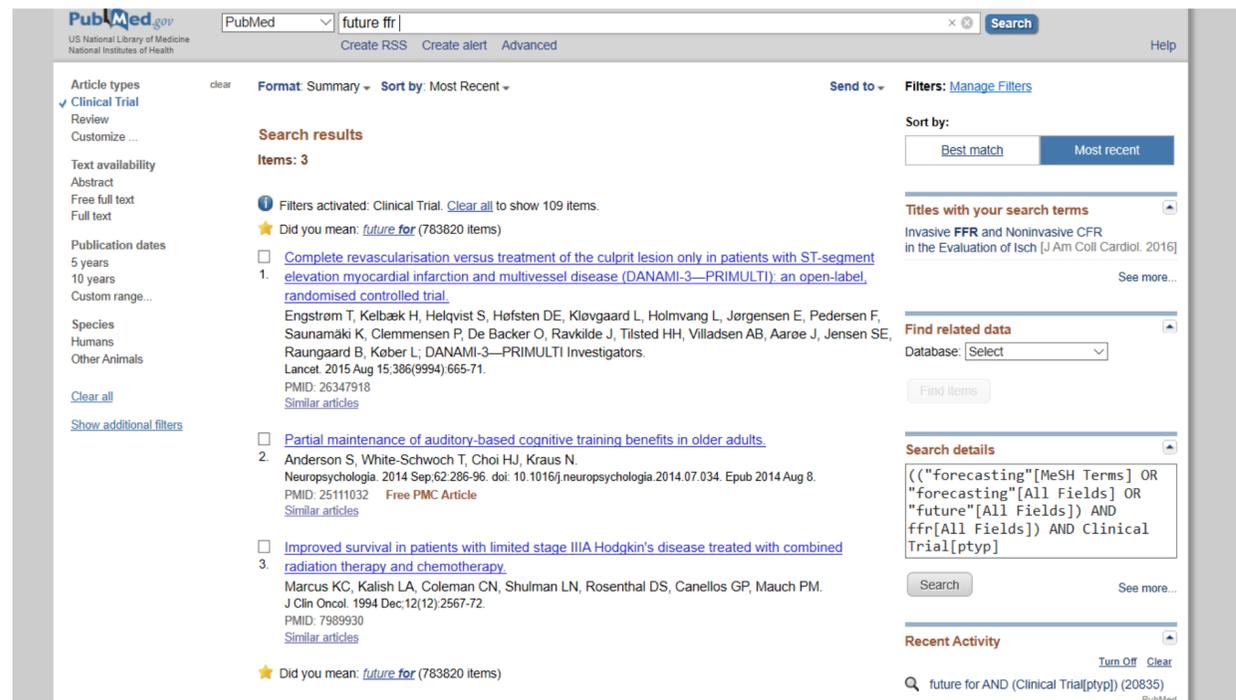


Des études cliniques négatives sur la FFR

FARGO

[J Am Coll Cardiol.](#) 2018 Dec 4;72(22):2732-2743.

FUTURE



The screenshot shows a PubMed search results page for the query 'future ffr'. The search results are filtered to 'Clinical Trial' and sorted by 'Most Recent'. Three items are listed:

- Complete revascularisation versus treatment of the culprit lesion only in patients with ST-segment elevation myocardial infarction and multivessel disease (DANAMI-3—PRIMULTI): an open-label, randomised controlled trial.**
Engstrom T, Kelbaek H, Helqvist S, Hofsten DE, Klovgaard L, Holmvang L, Jorgensen E, Pedersen F, Saunamäki K, Clemmensen P, De Backer O, Ravkilde J, Tilsted HH, Villadsen AB, Aaroe J, Jensen SE, Raungaard B, Køber L; DANAMI-3—PRIMULTI Investigators.
Lancet. 2015 Aug 15;386(9994):665-71.
PMID: 26347918
[Similar articles](#)
- Partial maintenance of auditory-based cognitive training benefits in older adults.**
Anderson S, White-Schwoch T, Choi HJ, Kraus N.
Neuropsychologia. 2014 Sep;62:286-96. doi: 10.1016/j.neuropsychologia.2014.07.034. Epub 2014 Aug 8.
PMID: 25111032 [Free PMC Article](#)
[Similar articles](#)
- Improved survival in patients with limited stage IIIA Hodgkin's disease treated with combined radiation therapy and chemotherapy.**
Marcus KC, Kalish LA, Coleman CN, Shulman LN, Rosenthal DS, Canellos GP, Mauch PM.
J Clin Oncol. 1994 Dec;12(12):2567-72.
PMID: 7989930
[Similar articles](#)

At the bottom, it says 'Did you mean: [future for](#) (783820 items)'. The search details show the query: `((("forecasting"[MeSH Terms] OR "forecasting"[All Fields] OR "future"[All Fields]) AND ffr[All Fields]) AND Clinical Trial[ptyp])`



FARGO: FFR pour guider les pontages?

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Fractional Flow Reserve Versus Angiographically-Guided Coronary Artery Bypass Grafting



Anne Langhoff Thuesen, MD,^a Lars Peter Riber, MD, PhD,^b Karsten Tange Veien, MD,^a
Evald Høj Christiansen, MD, PhD,^c Svend Eggert Jensen, MD, PhD,^d Ivy Modrau, MD, DMSci,^e
Jan Jesper Andreasen, MD, PhD,^{f,g} Anders Junker, MD, PhD,^a Poul Erik Mortensen, MD,^b
Lisette Okkels Jensen, MD, DMSci, PhD^a



FFR et pontages

Pourquoi 6 mois????????????????

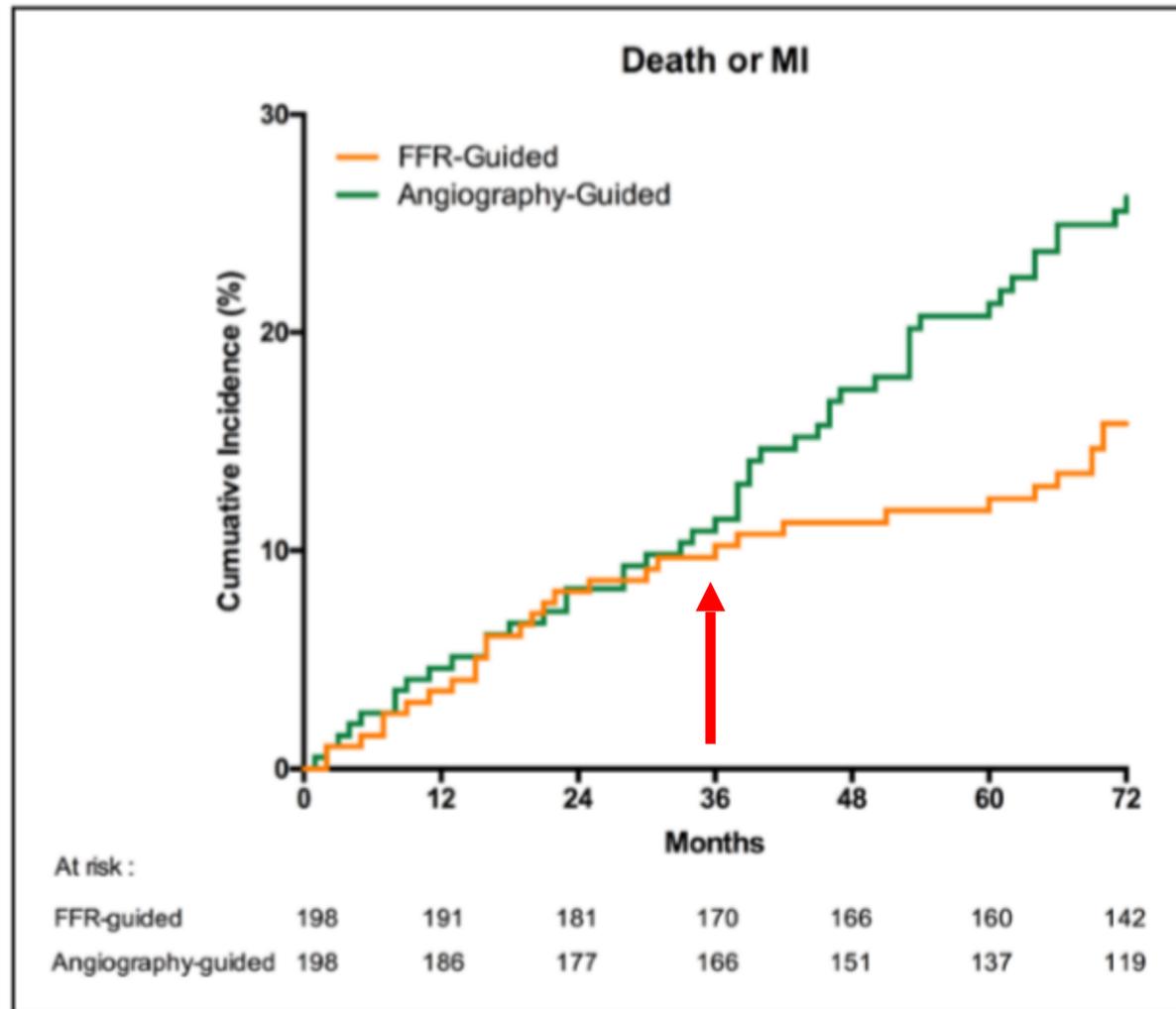


Figure 2. Kaplan–Meier graph reporting the cumulative incidence of death or myocardial infarction (MI) out to 6 years in the matched cohort (log rank: 0.021; *P* value: 0.024). FFR indicates fractional flow reserve.

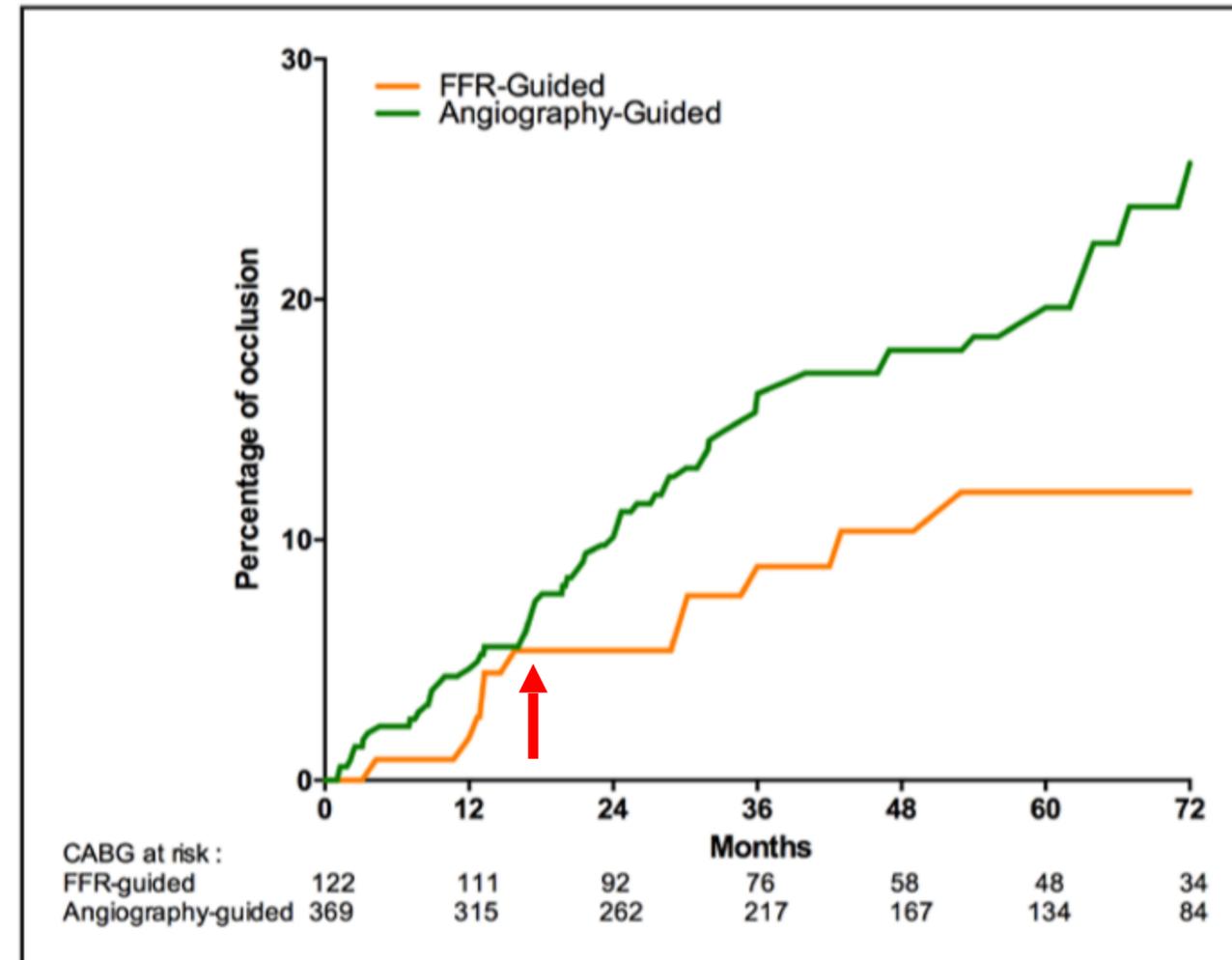


Figure 5. Kaplan–Meier graph is reporting the cumulative incidence of graft occlusion (log rank: 0.027; *P* value: 0.022). CABG indicates coronary artery bypass graft; FFR, fractional flow reserve.

FARGO, calcul de puissance

84 patients par groupes

SAMPLE SIZE AND POWER CALCULATION. The primary purpose of the data analysis was to assess graft patency after 6 months in patients who underwent FFR-guided CABG versus angiography-guided CABG. We estimated minimum sample size to be 84 patients in each group, based on a 2-sided chi-square test with an alpha level of 0.05 and a statistical power of 0.80. We estimated a graft occlusion rate of 20% after 6 months in the grafts to arteries with FFR >0.8, as well as a graft occlusion rate of 5% in grafts to arteries with FFR \leq 0.80 and a dropout rate of 15%. These graft patency rates were based on data from the study by Botman et al. (6) from 2007; these were the only available rates when the study was designed.

FARGO

Résultats

TABLE 2 Baseline Characteristics of Invasive and Surgical Procedures

	FFR-Guided CABG (n = 49)	Angio-Guided CABG (n = 48)	p Value
FFR procedure characteristics			
No. of coronary arteries evaluated with FFR	85	72	
LAD	20 (24)	15 (21)	0.54
Diagonals	7 (8)	3 (4)	
CX	28 (33)	29 (40)	
RCA	30 (35)	25 (35)	
FFR evaluated arteries/patient	1.7 ± 0.9	1.5 ± 0.7	0.23
Mean FFR at index	0.78 ± 0.12	0.77 ± 0.13	0.54
Graft plan characteristics			
Angiographic graft plan	3.2 ± 0.7	3.2 ± 0.8	0.87
Final graft plan, n	2.5 ± 0.9	3.2 ± 0.8	<0.001
Anastomosis per patient	2.6 ± 0.9	3.0 ± 0.9	0.005
Grafted according to randomization	43 (88)	42 (88)	0.97
Grafted coronary arteries			
All grafts	123	144	
LAD grafted	47 (38)	48 (33)	0.84
Diagonals grafted	10 (8)	11 (8)	
CX grafted	38 (31)	50 (35)	
RCA grafted	28 (23)	35 (24)	
Graft characteristics			
Arterial grafts	50 (41)	50 (35)	0.32
Venous grafts	73 (59)	94 (65)	
CABG procedure characteristics			
Patients operated	49	48	
Rate of on-pump procedure	44 (90)	46 (96)	0.25
ECC time, min	77 ± 26	88 ± 31	0.075
Clamp time, min	43 ± 16	49 ± 22	0.12
Maximal CK-MB value, µg/l	39.1 ± 32.3	35.5 ± 39.4	0.62
Hospitalization, days	5.9 ± 1.9	6.3 ± 2.5	0.44
Reoperation or PCI first 7 days post-CABG			
Acute graft failure	1 (2)	0 (0)	—
Bleeding	2 (4)	2 (4)	—
Hybrid revascularization	1 (2)	3 (6)	—
PCI of deferred coronary artery	0 (0)	0 (0)	—

Values are n, n (%), or mean ± SD.

CK-MB = creatine kinase MB; CX = circumflex coronary artery; ECC = extra corporal circulation; LAD = left anterior descending coronary artery; RCA = right coronary artery; other abbreviations as in Table 1.

TABLE 3 Primary and Secondary Endpoints in Patients at 6 Months

	FFR-Guided CABG (n = 49)	Angio-Guided CABG (n = 48)	p Value
Patients with invasive follow-up at 6 months	39	33	
Graft failures			
Graft failures/all grafts per patient	16 ± 29	12 ± 17	0.97
Patients with graft failure	11 (28)	11 (33)	0.64
Patients with graft occlusion	6 (15)	5 (15)	0.90
6-month clinical endpoints (all patients)			
Death	0 (0)	2 (4)	0.24
Myocardial infarction	1 (2)	0 (0)	0.50
Stroke	2 (4)	1 (2)	0.51
All revascularizations before follow-up	3 (6)	3 (6)	1.00
Hybrid revascularization decided at CABG	1 (2)	3 (6)	
Other revascularizations	2 (4)	0 (0)	
MACCE	6 (12)	6 (12)	0.97
CCS II–IV	5 (10)	2 (4)	0.29

Values are n, mean ± SD, or n (%).

MACCE = major adverse cardiac and cerebral event(s); other abbreviations as in Table 1.

84 patients par groupes???

FARGO

Conclusion

Manque de puissance
Follow-up trop court



Attente GRAFFITI study

Toth G et al Study design of the graft patency after FFR-guided versus angiography-guided CABG trial (GRAFFITI). J Cardiovasc Transl Res. 2018;11:269–273. doi: 10.1007/s12265-018-9818-9

FUTURE, une étude ambitieuse

FUTURE Study Hypothesis



In multivessel disease patients, does FFR help to guide treatment strategy (PCI or CABG or medical treatment only) and thereby improve clinical prognosis compared to traditional management ?

FUTURE Primary Composite Endpoint, at one year

***All cause mortality + Myocardial Infarction
+ Repeat revascularization + Stroke***

- Multicenter, randomized, prospective, open-label, controlled study in 31 french centers
- Academic Sponsor : Hospices Civils de Lyon - NCT01881555
- French Health Ministry grant (*Programme Hospitalier de Recherche Clinique 2011*)
- Superiority design for 30% lower RRR MACE at 1 year in the FFR group
- 1728 patients to be recruited (864/group)



Study design

exclusion criteria
STEMI < 12h
no LAD disease
CI to FFR

All-comer Patient with stable or stabilized angina
Multivessel-disease (>50% stenosis) including LAD
at the time of angiography

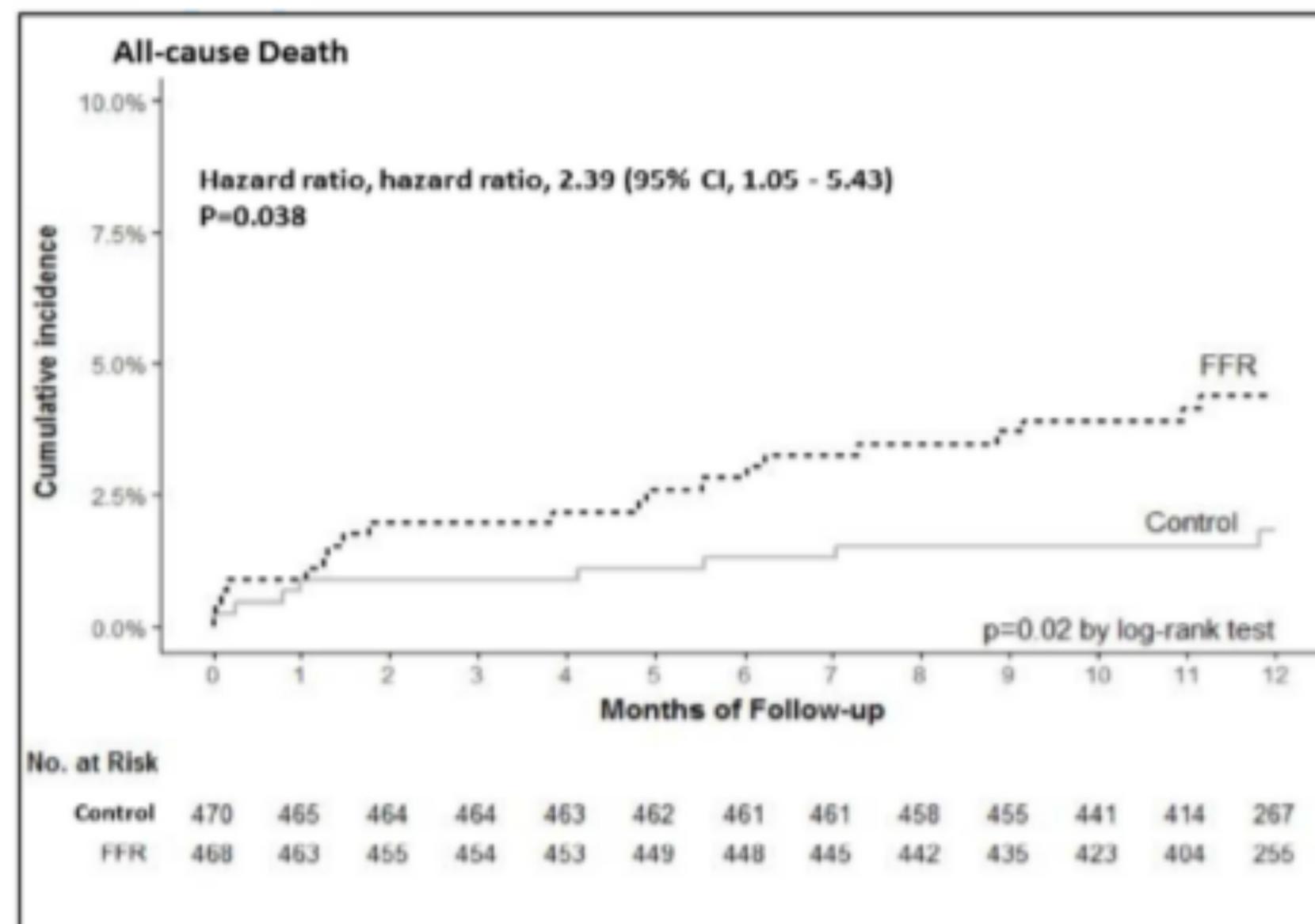
Randomisation 1:1

FFR-guided

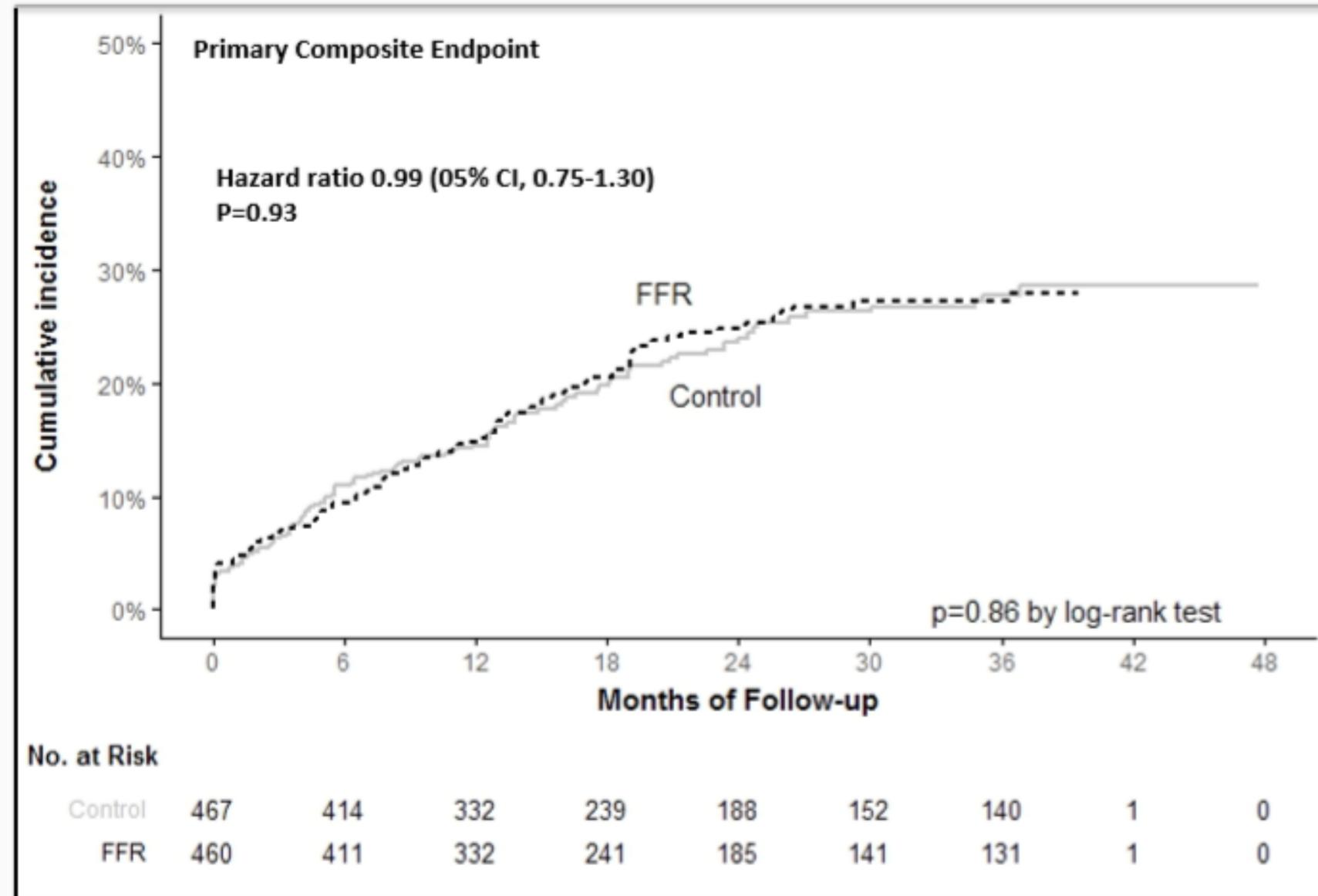
Angio-guided



Recruitment stop at n=938 patients after DSMB recommendation
All-cause death at one year - safety analysis



Primary endpoint (death – MI – revasc – stroke) median FU at 2 years - ITT



FUTURE en bref

- Population grave
 - Plus de diabétiques sous insuline dans le groupe FFR
 - >50% de tritronculaire, >10% de TCG
 - Lésions complexes+++
 - Syntax > 32+++ dans le groupe FFR
 - >90% de PCI ad hoc!

Ce n'est pas l'esprit de la FFR

FUTURE, l'avis du PI 48 hours ago



Je n'ai jamais fait autant de FFR que depuis FUTURE, j'te jure!

La FFR il faut la faire mais faut pas déconner les mecs avec les patients et lésions complexes!

Dis leur, la FFR il faut la faire!

Good luck!

Conclusion

- **Impact FARGO**
 - Trop de limites pour tirer des conclusions
 - Attente étude GRAFITTI +++
- **Impact FUTURE**
 - Attention aux lésions complexes
- **Nous devons continuer à faire de la FFR!**
 - Niveau de preuve
 - Nombre de patients inclus
 - Suivi

Conclusion

