26-27-28 JANVIER 2022 HIGH TECH MARSEILLE

Patient pluritronculaire : angioplastie ou chirurgie ? Apport de la FFR après FAME 3

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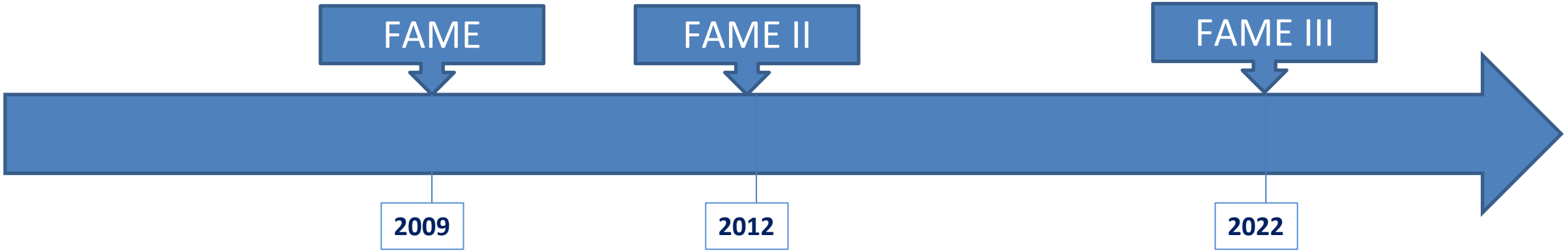
FACT: French Alliance for Cardiovascular clinical Trials

Liens d’intérêts

- **Bourses de recherche :** Abbott, Astra-Zeneca, Bayer, MSD
- **Honoraires (orateur ou consultant) :** Abbott, Amgen, Astra-Zeneca, BMS, Bayer, Biotronik, Boehringer Ingelheim, Daiichi-Sankyo, Lilly, MSD, Novartis, Pfizer, Organon, Sanofi, Servier, Vifor Pharma

Programme FAME



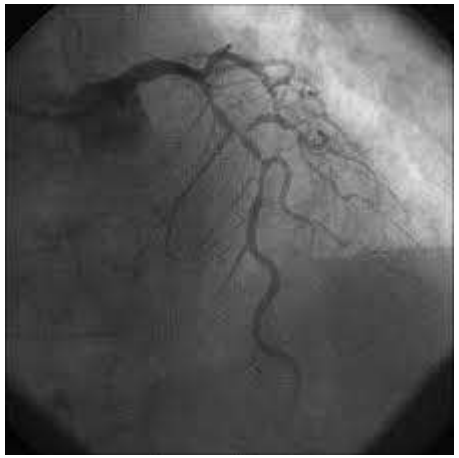
Recommendations	Class[a]	Level[b]
FFR to identify haemodynamically relevant coronary lesion(s) in stable patients when evidence of ischaemia is not available.	I	A

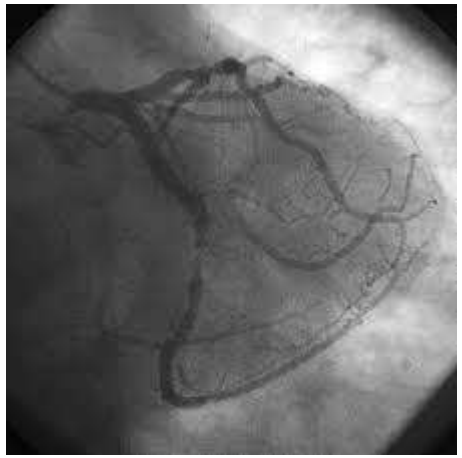
Recommendations	Class[a]	Level[b]
FFR-guided PCI in patients with multivessel disease.	IIa	B

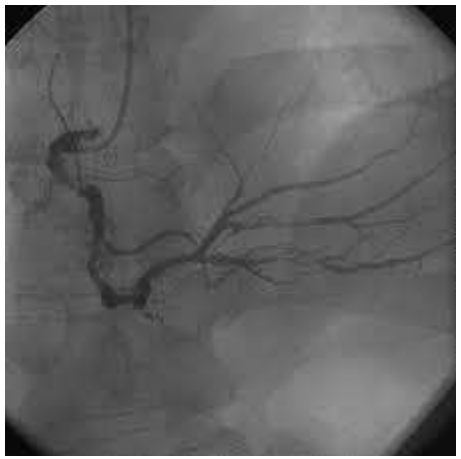
2014 ESC/EACTS Guidelines on myocardial revascularization. EHJ 2014

Fearon WF et al. NEJM 2022
De Bruyne et al. NEJM 2012
Tonino et al. NEJM 2009

FAME 3 : Rationnel







✓ **Recommandations ESC 2014 :**

Recommendations according to extent of CAD	CABG		PCI	
	Class[a]	Level[b]	Class[a]	Level[b]
One or two-vessel disease without proximal LAD stenosis.	IIb	C	I	C
One-vessel disease with proximal LAD stenosis.	I	A	I	A
Two-vessel disease with proximal LAD stenosis.	I	B	I	C
Left main disease with a SYNTAX score ≤ 22.	I	B	I	B
Left main disease with a SYNTAX score 23–32.	I	B	IIa	B
Left main disease with a SYNTAX score >32.	I	B	III	B
Three-vessel disease with a SYNTAX score ≤ 22.	I	A	I	B
Three-vessel disease with a SYNTAX score 23–32.	I	A	III	B
Three-vessel disease with a SYNTAX score >32.	I	A	III	B

✓ **Rationnel de FAME 3 :**

FFR-Guided PCI
vs.
Coronary bypass surgery

2014 ESC/EACTS Guidelines on myocardial revascularization. EHJ 2014

Fearon WF et al. NEJM 2022

FAME 3 : Schéma de l'étude

Patients tri tronculaires

- ✓ Sténoses (visuelles) ≥ 50% sur les 3 vaisseaux épicardiques
- ✓ Revascularisation réalisable par PCI ou CABG

R: 1/1

- ✓ Atteinte du tronc commun
- ✓ STEMI récent
- ✓ Choc cardiogénique
- ✓ FEVG < 30%

Revascularisation chirurgicale

Revascularisation percutanée guidée par la FFR

Critère de jugement principal : décès, infarctus du myocarde, AVC, ou revascularisation à 1 an

Fearon WF et al. NEJM 2022

FAME 3 : Méthodologie

- **Etude internationale, multicentrique, randomisée**
- **Etude de non-infériorité :**
  - ✓ 12% d'évènements attendus sur le critère principal à 1 an (groupe « pontage »)
  - ✓ Limite supérieure < 1,45 pour l'intervalle de confiance de 95% de l'HR
  - ✓ **712 patients par groupe (1424 patients)**
- **Techniques :**

Groupe « pontage »	Groupe « angioplastie »
Greffon artériel recommandé	Angioplastie recommandée si FFR ≤ 0,80
Pas de FFR (résultat utilisable si disponible)	DES zotarolimus (Resolute integrity ou Onyx)
	DAPT ≥ 6 mois

FAME 3 : Caractéristiques de la population

Table 1. Characteristics of the Patients at Baseline.*

Characteristic	PCI (N=757)	CABG (N=743)
Age — yr	65.2±8.6	65.1±8.3
Male sex — no. (%)	616 (81.4)	619 (83.3)
White race — no. (%)†	711 (93.9)	686 (92.3)
Body-mass index‡	28.6±4.5	28.7±4.3
Diabetes — no. (%)	214 (28.3)	214 (28.8)
Insulin-dependent	55 (7.3)	61 (8.2)
Non–insulin-dependent	159 (21.0)	153 (20.6)
Hypertension — no./total no. (%)	538/756 (71.2)	556/741 (75.0)
Dyslipidemia — no./total no. (%)	521/756 (68.9)	531/741 (71.7)
Smoking status — no./total no. (%)		
Current tobacco user	145/756 (19.2)	136/741 (18.4)
Previous tobacco user	296/756 (39.2)	296/741 (39.9)
Family history of coronary artery disease — no./total no. (%)	246/756 (32.5)	213/740 (28.8)
Previous myocardial infarction — no./total no. (%)	252/756 (33.3)	248/741 (33.5)
Previous PCI — no./total no. (%)	98/756 (13.0)	104/741 (14.0)
History of TIA or CVA — no./total no. (%)	49/756 (6.5)	56/741 (7.6)
Kidney disease — no./total no. (%)§	37/756 (4.9)	44/741 (5.9)
Noninvasive test for ischemia — no./total no. (%)	311/756 (41.1)	301/741 (40.6)
LVEF ≤50% — no./total no. (%)	137/753 (18.2)	130/740 (17.6)
Hospitalized with NSTE-ACS — no./total no. (%)	300/756 (39.7)	287/741 (38.7)

FAME 3 : Caractéristiques des procédures

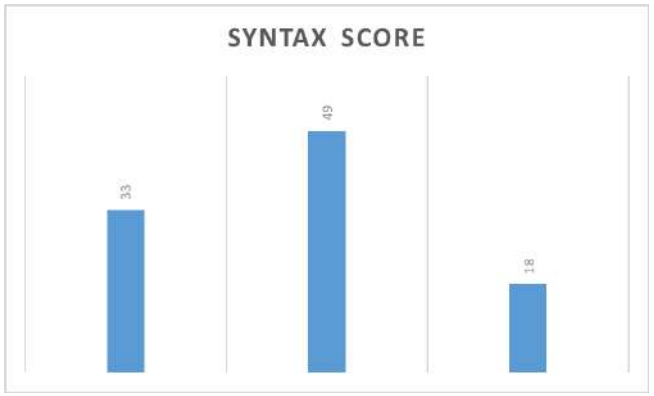
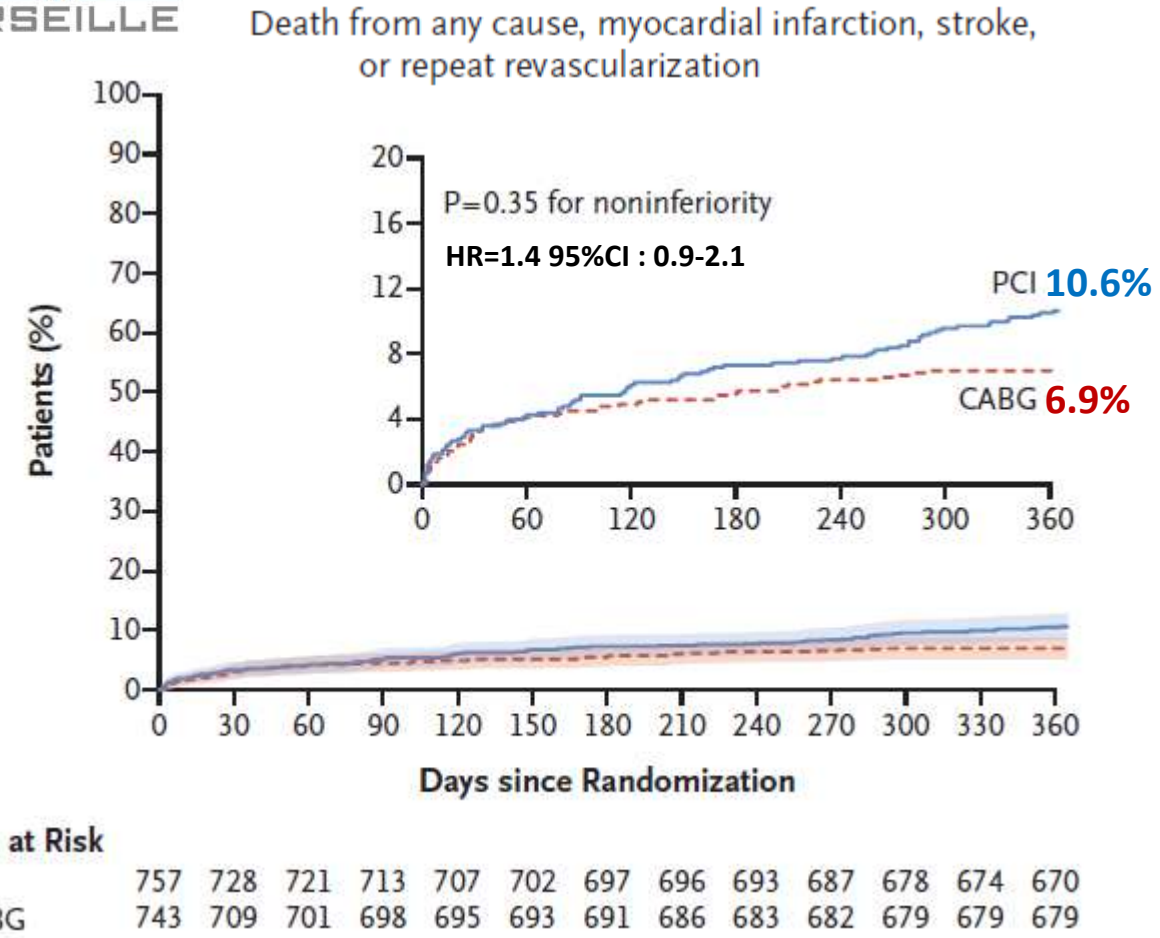


Table 2. Angiographic and Procedural Characteristics.*

Characteristic	PCI (N=757)	CABG (N=743)
Median time to procedure (IQR) — days	4 (1–13)	13 (6–26)
Median procedure duration (IQR) — min	87 (67–113)	197 (155–239)
Median length of hospital stay (IQR) — days	3 (1–7)	11 (7–16)
No. of lesions	4.3±1.3	4.2±1.2
At least one chronic total occlusion — no./total no. (%)	157/755 (20.8)	171/739 (23.1)
At least one bifurcation lesion — no./total no. (%)	522/755 (69.1)	491/739 (66.4)
SYNTAX score†	26.0±7.1	25.8±7.1
SYNTAX score category — no./total no. (%)†		
Low, 0 to 22	237/734 (32.3)	245/710 (34.5)
Intermediate, 23 to 32	365/734 (49.7)	343/710 (48.3)
High, >32	132/734 (18.0)	122/710 (17.2)
PCI characteristics		
Staged procedure — no./total no. (%)	166/750 (22.1)	NA
No. of stents	3.7±1.9	NA
Median total length of stents placed (IQR) — mm	80 (52–116)	NA
Intravascular imaging used — no./total no. (%)	87/744 (11.7)	NA
CABG characteristics		
Multiple arterial grafts — no./total no. (%)	NA	173/705 (24.5)
No. of distal anastomoses	NA	3.4±1.0
LITA used as graft — no./total no. (%)	NA	684/705 (97.0)
Off-pump surgery — no./total no. (%)	NA	168/698 (24.1)
FFR used before CABG — no./total no. (%)	NA	72/718 (10.0)

Evaluation par FFR :
- ✓ 82% des lésions
- ✓ Moyenne : 0.70
- ✓ FFR ≥ 0.80 : 24%

FAME 3 : Critères principal et secondaires



FAME 3 : Critères principal et secondaires

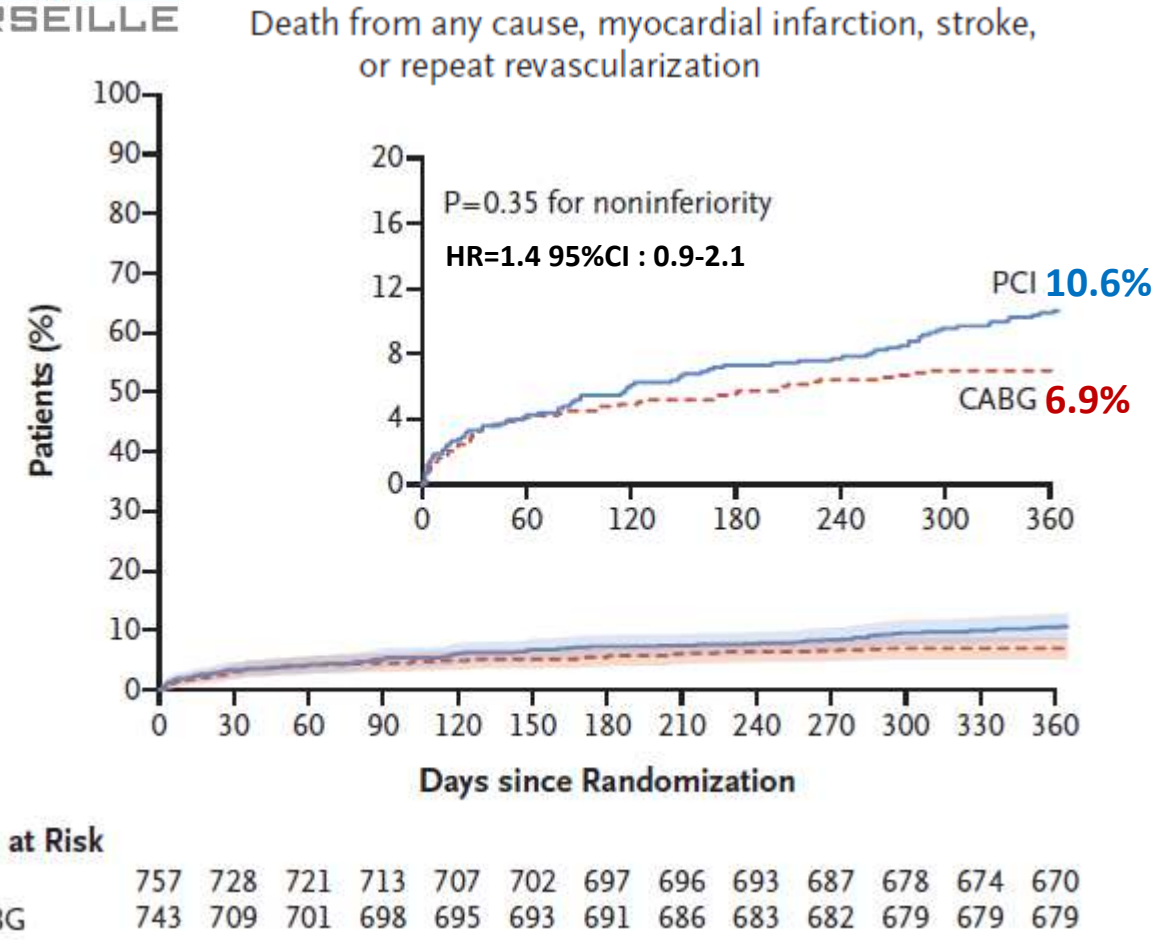
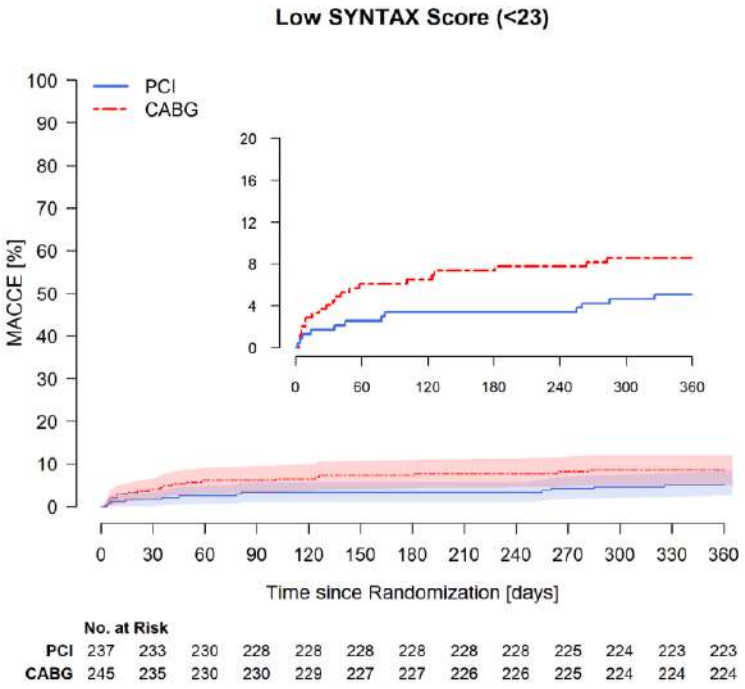
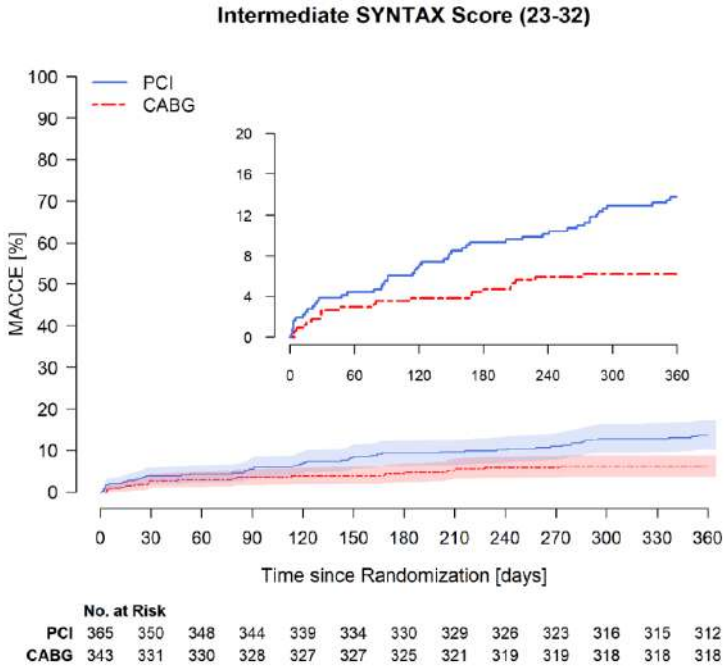


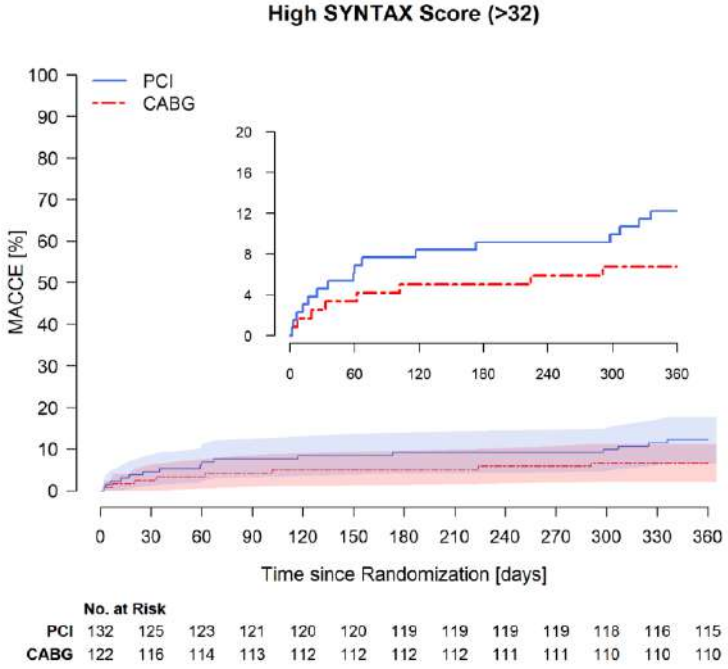
Table 3. End Points at 1 Year.

End Point	PCI (N=757)	CABG (N=743)	Hazard Ratio (95% CI)	P Value
	*no. of patients (%)**			
Primary end point				
Death from any cause, myocardial infarction, stroke, or repeat revascularization	80 (10.6)	51 (6.9)	1.5 (1.1–2.2)	0.35†
Secondary end points‡				
Death	12 (1.6)	7 (0.9)	1.7 (0.7–4.3)	
Death from cardiac causes	6 (0.8)	4 (0.5)		
Myocardial infarction	39 (5.2)	26 (3.5)	1.5 (0.9–2.5)	
Spontaneous	25 (3.3)	17 (2.3)		
Procedural	13 (1.7)	9 (1.2)		
Stroke	7 (0.9)	8 (1.1)	0.9 (0.3–2.4)	
Death, myocardial infarction, or stroke	55 (7.3)	39 (5.2)	1.4 (0.9–2.1)	
Repeat revascularization	45 (5.9)	29 (3.9)	1.5 (0.9–2.3)	
PCI	39 (5.2)	26 (3.5)		
CABG	6 (0.8)	3 (0.4)		
Safety end points§				
BARC type 3–5 bleeding¶	12 (1.6)	28 (3.8)		0.009
Acute kidney injury‖	1 (0.1)	7 (0.9)		0.04
Atrial fibrillation or clinically significant arrhythmia	18 (2.4)	105 (14.1)		<0.001
Definite stent thrombosis	6 (0.8)	NA		
Definite symptomatic graft occlusion	NA	10 (1.3)		
Rehospitalization within 30 days	42 (5.5)	76 (10.2)		<0.001

Analyse selon le Syntax score







Que retenir de FAME 3 ?

Chez les patients tri tronculaires (hors STEMI récent, sans lésion du tronc commun) :

- La stratégie de revascularisation par angioplastie guidée par la FFR n'a pas atteint la non-infériorité (10,6% vs 6,9%)
- Plus d'évènements CV majeurs (décès, infarctus, revascularisations itératives) dans le bras « angioplastie »
- Plus de saignements (BARC 3-5), d'arythmies (FA), de ré hospitalisations à 30 jours et une durée d'hospitalisation plus longue dans le bras « chirurgie »

Que retenir de FAME 3 ?

Limites de l'étude :

- Population sélectionnée (hors STEMI récent, sans lésion du tronc commun, lésions « franchissables »)
- Taux d'évènements faible : 6,9% dans le groupe « pontage » (12% attendus)
- Durée de suivi courte
- Evaluations de la qualité de vie et médico-économique non disponibles

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- Evaluations de la qualité de vie et médico-économique non disponibles

Perspectives :

- Utilisation de la FFR pour guider la revascularisation chirurgicale

26-27-28 JANVIER 2022 HIGH TECH MARSEILLE

Place de FFR en 2022 ?

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Multivessel PCI Guided by FFR or Angiography for Myocardial Infarction

Etienne Puymirat, M.D., Ph.D., Guillaume Cayla, M.D., Ph.D., Tabassome Simon, M.D., Ph.D., Philippe G. Steg, M.D., Gilles Montalescot, M.D., Ph.D., Isabelle Durand-Zaleski, M.D., Ph.D., Alicia le Bras, M.D., Romain Gallet, M.D., Ph.D., Khalife Khalife, M.D., Jean-François Morelle, M.D., Pascal Motreff, M.D., Ph.D., Gilles Lemesle, M.D., Ph.D., Jean-Guillaume Dillinger, M.D., Ph.D., Thibault Lhermusier, M.D., Ph.D., Johanne Silvain, M.D., Ph.D., Vincent Roule, M.D., Ph.D., Jean-Noel Labèque, M.D., Grégoire Rangé, M.D., Grégory Ducrocq, M.D., Ph.D., Yves Cottin, M.D., Didier Blanchard, M.D., Anaïs Charles Nelson, N.D., Bernard De Bruyne, M.D., Ph.D., Gilles Chatellier, M.D., and Nicolas Danchin, M.D., for the FLOWER-MI Study Investigators*

FLOWER MI

ABSTRACT

BACKGR… In pati… disease… revascu… whethe… is supe… …ltivessel …omplete …owever, …e (FFR)

METHODS
In this multicenter trial, we randomly assigned patients with STEMI and multivessel disease who had undergone successful PCI of the infarct-related artery to receive complete revascularization guided by either FFR or angiography. The primary outcome was a composite of death from any cause, nonfatal myocardial infarction, or unplanned hospitalization leading to urgent revascularization at 1 year.

RESULTS
The mean (±SD) number of stents that were placed per patient for nonculprit lesions was 1.01±0.99 in the FFR-guided group and 1.50±0.86 in the angiography-guided group. During follow-up, a primary outcome event occurred in 32 of 586 patients (5.5%) in the FFR-guided group and in 24 of 577 patients (4.2%) in the angiography-guided group (hazard ratio, 1.32; 95% confidence interval, 0.78 to 2.23; P=0.31). Death occurred in 9 patients (1.5%) in the FFR-guided group and in 10 (1.7%) in the angiography-guided group; nonfatal myocardial infarction in 18 (3.1%) and 10 (1.7%), respectively; and unplanned hospitalization leading to urgent revascularization in 15 (2.6%) and 11 (1.9%), respectively.

CONCLUSIONS
In patients with STEMI undergoing complete revascularization, an FFR-guided strategy did not have a significant benefit over an angiography-guided strategy with respect to the risk of death, myocardial infarction, or urgent revascularization at 1 year. However, given the wide confidence intervals for the estimate of effect, the findings do not allow for a conclusive interpretation. (Funded by the French Ministry of Health and Abbott; FLOWER-MI ClinicalTrials.gov number, NCT02943954.)

ESC Press Office › Press releases

Systematic pressure wire assessment has no additional benefit at diagnostic angiography

RIPCORD2 trial presented in a Hot Line Session today at ESC Congress

29 Aug 2021

RIPCORD 2

Fractional Flow Reserve to Guide Treatment of Patients With Multivessel Coronary Artery Disease

Gilles Rioufol, MD, PhD,[a] François Dérimay, MD, PhD,[a] François Roubille, MD, PhD,[b] Thibault Perret, MD,[c] Pascal Motreff, MD, PhD,[d] Denis Angoulvant, MD, PhD,[e] Yves Cottin, MD, PhD,[f] Ludovic Meunier, MD,[g] Laura Cetran, MD,[h] Guillaume Cayla, MD, PhD,[i] Brahim Harbaoui, MD,[j] Jean-Yves Wiedemann, MD,[k] Éric Van Belle, MD, PhD,[l] Christophe Pouillot, MD,[m] Nathalie Noirclerc, MD,[n] Jean-François Morelle, MD,[o] François-Xavier Soto, MD,[p] Christophe Caussin, MD,[q] Bernard Bertrand, MD,[r] Thierry Lefèvre, MD,[s] Patrick Dupouy, MD,[t] Pierre-François Lesault, MD, PhD,[u] Franck Albert, MD,[v] Olivier Barthelemy, MD,[w] René Koning, MD,[x] Laurent Leborgne, MD,[y] Pierre Bamay, MD,[z] Philippe Chapon, MD,[aa] Sébastien Armero, MD,[bb] Antoine Lafont, MD,[cc] Christophe Piot, MD, PhD,[dd] Camille Amaz, MSc,[ee] Bernadette Vaz, PharmD, MSc,[ee] Lakhdar Benyahya, PhD,[ee] Yvonne Varillon,[ee] Michel Ovize, MD, PhD,[ee] Nathan Mewton, MD, PhD,[ee,*] Gérard Finet, MD, PhD,[a,*] on behalf of the FUTURE Trial Investigators

FUTURE

ABSTRACT

BACKGROUND There is limited evidence that fractional flow reserve (FFR) is effective in guiding therapeutic strategy in multivessel coronary artery disease (CAD) beyond prespecified percutaneous coronary intervention or coronary graft surgery candidates.

OBJECTIVES Th… …aimed to evaluate whether a treatment strate… …tment of multivessel CAD.

METHODS The F… …essel CAD candidates were randomly assigne… …arteries or to a traditional strategy without F… …n or surgery) was indicated for FFR ≤0.80 lesi… …cerebrovascular events at 1 year.

RESULTS The trial was stopped prematurely by the data safety and monitoring board after a safety analysis and 927 patients were enrolled. At 1-year follow-up, by intention to treat, there were no significant differences in major adverse cardiac or cerebrovascular events rates between groups (14.6% in the FFR group vs 14.4% in the control group; hazard ratio: 0.97; 95% confidence interval: 0.69-1.36; $P = 0.85$). The difference in all-cause mortality was nonsignificant, 3.7% in the FFR group versus 1.5% in the control group (hazard ratio: 2.34; 95% confidence interval: 0.97-5.18; $P = 0.06$), and this was confirmed with a 24 months' extended follow-up. FFR significantly reduced the proportion of revascularized patients, with more patients referred to exclusively medical treatment ($P = 0.02$).

CONCLUSIONS In patients with multivessel CAD, we did not find evidence that an FFR-guided treatment strategy reduced the risk of ischemic cardiovascular events or death at 1-year follow-up. (Functional Testing Underlying Coronary Revascularisation; NCT01881555) (J Am Coll Cardiol 2021;78:1875–1885) © 2021 by the American College of Cardiology Foundation.

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Fractional Flow Reserve–Guided PCI as Compared with Coronary Bypass Surgery

W.F. Fearon, F.M. Zimmermann, B. De Bruyne, Z. Piroth, A.H.M. van Straten, L. Szekely, G. Davidavičius, G. Kalinauskas, S. Mansour, R. Kharbanda, N. Östlund-Papadogeorgos, A. Aminian, K.G. Oldroyd, N. Al-Attar, N. Jagic, J.-H.E. Dambrink, P. Kala, O. Angerås, P. MacCarthy, O. Wendler, F. Casselman, N. Witt, K. Mavromatis, S.E.S. Miner, J. Sarma, T. Engstrøm, E.H. Christiansen, P.A.L. Tonino, M.J. Reardon, D. Lu, V.Y. Ding, Y. Kobayashi, M.A. Hlatky, K.W. Mahaffey, M. Desai, Y.J. Woo, A.C. Yeung, and N.H.J. Pijls, for the FAME 3 Investigators*

FAME 3

ABSTRACT

BACKGROUND
Patients with three-vessel coronary artery disease have been found to have better outcomes with coronary-artery bypass grafting (CAEG) than with percutaneous coronary interv… (PCI), but studies in which PCI is guided by measurement of fractional…

METHODS
In this mul… …e-vessel coronary ar… …-guided PCI with cu… …oint was the occurrenc… …ular event, defined as death from any cause, myocardial infarction, stroke, or repeat revascularization. Noninferiority of FFR-guided PCI to CAEG was prespecified as an upper boundary of less than 1.65 for the 95% confidence interval of the hazard ratio. Secondary end points included a composite of death, myocardial infarction, or stroke; safety was also assessed.

RESULTS
A total of 1500 patients underwent randomization at 48 centers. Patients assigned to undergo PCI received a mean (±SD) of 3.7±1.9 stents, and those assigned to undergo CAEG received 3.4±1.0 distal anastomoses. The 1-year incidence of the composite primary end point was 10.6% among patients randomly assigned to undergo FFR-guided PCI and 6.9% among those assigned to undergo CAEG (hazard ratio, 1.5; 95% confidence interval [CI], 1.1 to 2.2), findings that were not consistent with noninferiority of FFR-guided PCI (P=0.35 for noninferiority). The incidence of death, myocardial infarction, or stroke was 7.3% in the FFR-guided PCI group and 5.2% in the CAEG group (hazard ratio, 1.4; 95% CI, 0.9 to 2.1). The incidences of major bleeding, arrhythmia, and acute kidney injury were higher in the CAEG group than in the FFR-guided PCI group.

CONCLUSIONS
In patients with three-vessel coronary artery disease, FFR-guided PCI was not found to be noninferior to CAEG with respect to the incidence of a composite of death, myocardial infarction, stroke, or repeat revascularization at 1 year. (Funded by Medtronic and Abbott Vascular; FAME 3 ClinicalTrials.gov number, NCT02100722.)