# La F.F.R. dans l'évaluation des lésions intermédiaires du TRONC COMMUN de l'artère coronaire gauche

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# LE TRONC COMMUN .
# QUEL CHALLENGE ?

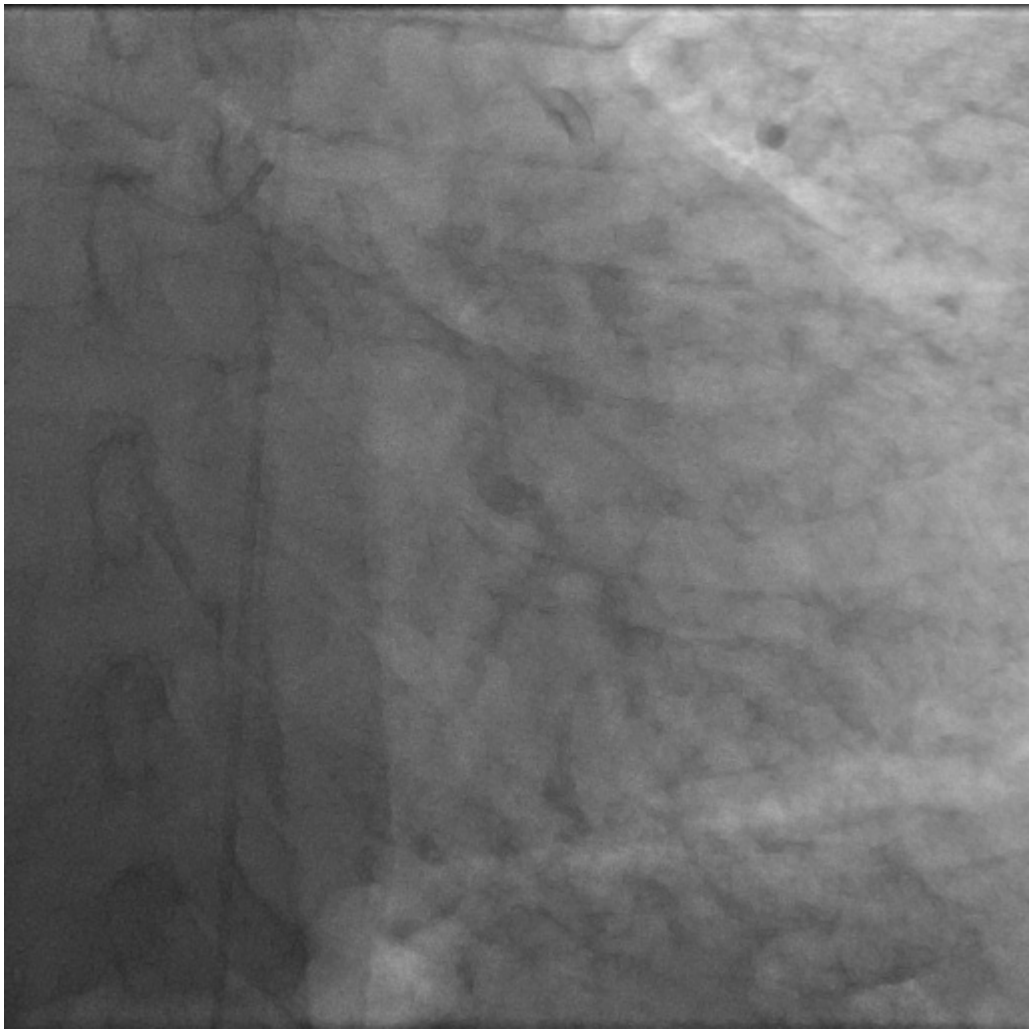
- Lésions intermédiaires du TC sont souvent difficiles à évaluer :
  - sanction : CBAG ou PCI .
  - Les tests non invasifs d'ischémie ne sont pas discriminants
  - Pas de segment de référence , les sondes 4F peuvent masquer une sténose ostiale .
  - Englobent le plus souvent la bifurcation
  - Angulation variable , souvent calcifié ,
  - évaluation difficile de la sévérité des sténoses en cas athérome diffus sans sténose focale.
  - Le tronc commun est rarement isolé
  - Pas de critères IVUS consensuels
  - La FFR est l' examen de choix pour évaluer la sévérité d' une sténose du tronc commun ++++

# La FFR est l' examen de choix pour évaluer la sévérité d' une sténose du tronc commun

- État hémodynamique stable.
- Voie intra veineuse : 140 µg/kg/min
- Retrait du cathéter guide dans l'aorte.
- Guide FFR dans l'IVA et/ou la CX en aval des sténoses .
- Valeur seuil : 0.80

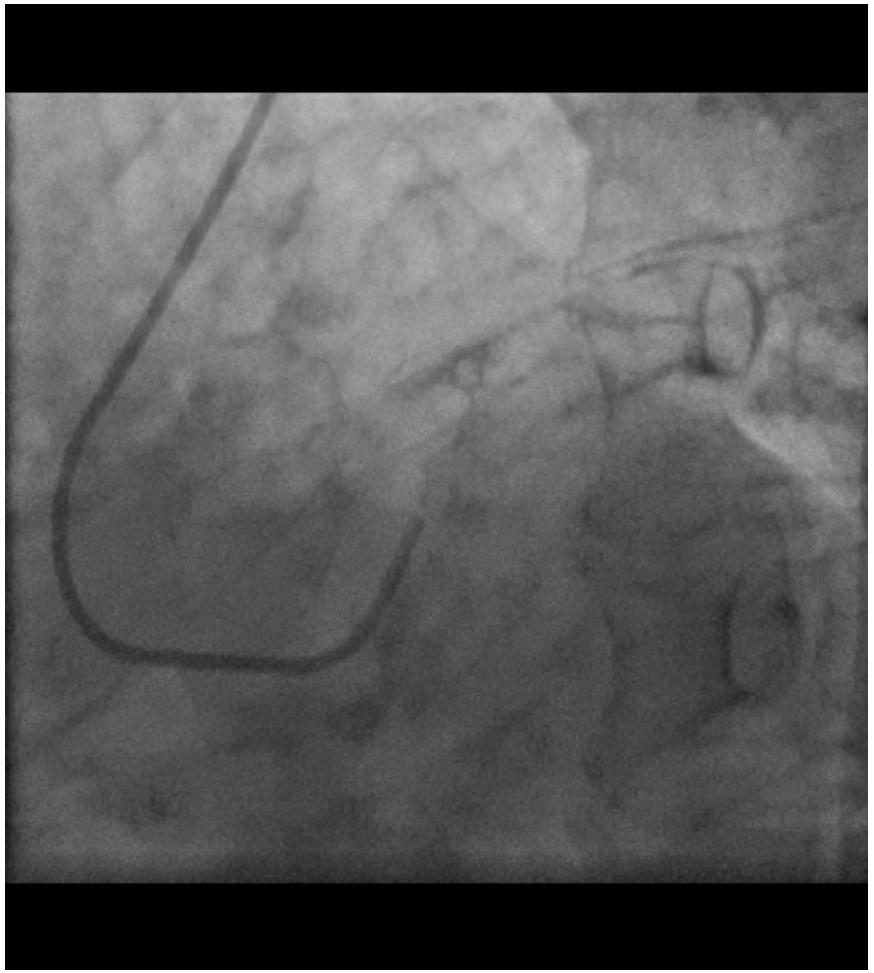
- H 1954
- FDR
  - Tabac  BPCO
  - HTA
  - Diabète
  - Insuffisance rénale chronique Hémodialyse
  - Atcd d AVC / Aomi
- Angor instable
  - PCI  de la CX  sept 2012
  - PCI de l IVA  nov 2012
- Nouvel épisode d angor instable en janvier 2013
- Euroscore  : 18 %
- Syntax : 13

**FFR 0.68**



- H . 1938
- Atcd
  - 2008 :PCI  DES IVA
- F.d.r.
  - HTA
  - Diabète type 2
  - Lipides
- Asymptomatique
- Ep. Eff. cliniquement - et ECG +  60 W
- Admis pour contrôle coro

FFR 0.73



## Visual-Functional Mismatch Between Coronary Angiography and Fractional Flow Reserve

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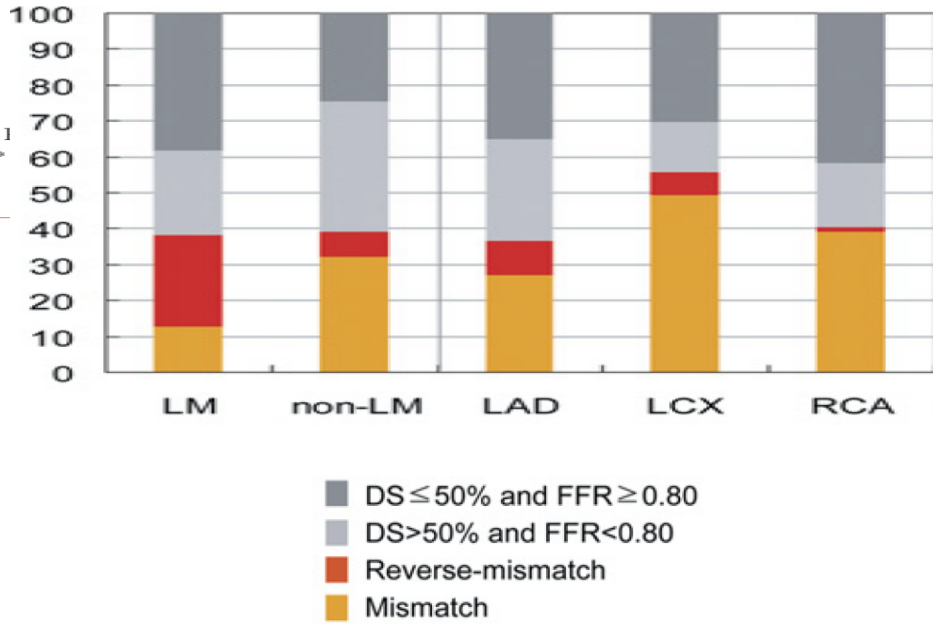
*Seoul and Kangwŏn-do, Korea; and New York, New York*




- Évaluation visuelle des sténoses intermédiaires vs FFR
- Mismatch :
  - DS > 50 % et FFR > 0.80
- Reverse Mismatch
  - DS < 50 % et FFR < 0.80
- Prospective mono centre
- 1000 pts 1129 lésions

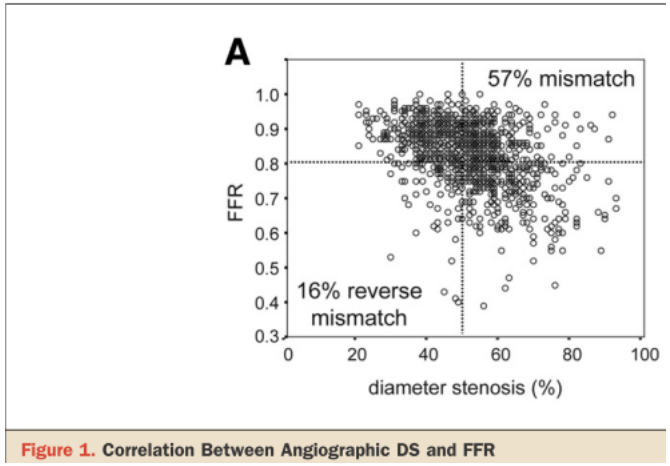



Figure 1. Correlation Between Angiographic DS and FFR

JACC Interv. 2012;5:1029-36

## The Impact of Downstream Coronary Stenoses on Fractional Flow Reserve Assessment of Intermediate Left Main Disease

David V. Daniels, MD,* Marcel van't Veer, MSc, PhD,†‡ Nico H. J. Pijls, MD, PhD,†‡ Arjen van der Horst, MSc,‡ Andy S. Yong, MBBS, PhD,* Bernard De Bruyne, MD, PhD,§ William F. Fearon, MD*

*Stanford, California; Eindhoven, the Netherlands; and Aalst, Belgium*

- Est-ce que la FFR du TC est valide en cas de sténoses en aval sur l' IVA et / ou la CX ?
- Modèle expérimental


**Figure 1. In Vitro Model of the Coronary Circulation**

An in vitro model of the coronary circulation with a left main artery (LM) that bifurcates into the left anterior descending (LAD) and left circumflex (LCX) branches with independently adjustable microcirculatory resistance. There are variable resistance constrictors around the LM and LAD.

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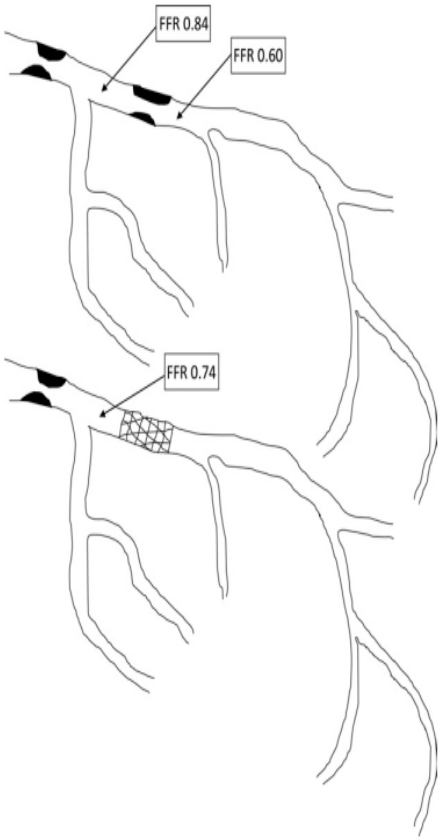


**Figure 3. Tandem Lesion Downstream**

This type of lesion will mask the true hemodynamic significance of the left main coronary artery lesion by compromising hyperemic flow and subsequent true maximal pressure gradient across this lesion. After percutaneous coronary intervention to the distal lesion, hyperemic blood flow through the vessel has increased, hence the true fractional flow reserve (FFR) of the left main coronary artery lesion becomes apparent.

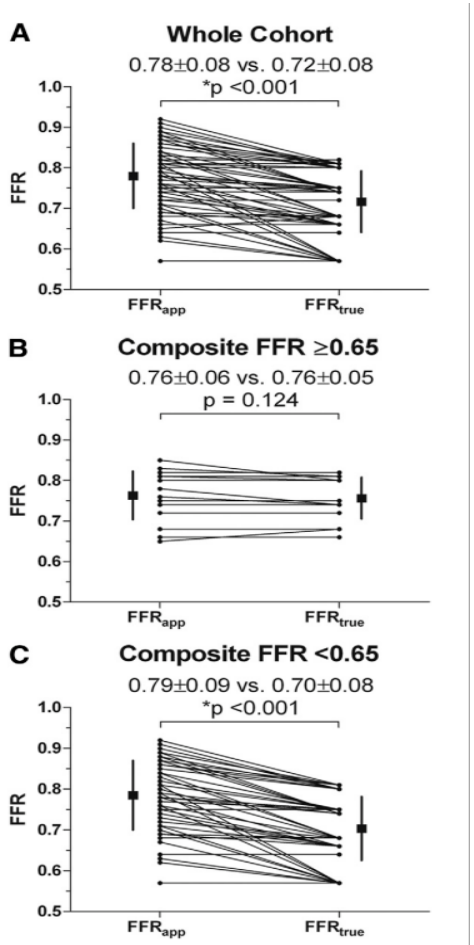


**Figure 3. Impact of Epicardial Stenosis Severity on Assessment of LM FFR**

**(A)** FFR difference between $FFR_{LM\ apparent}$ and $FFR_{LM\ true}$ for the entire cohort. **(B)** Difference between $FFR_{LM\ apparent}$ and $FFR_{LM\ true}$ for epicardial lesions with an FFR ≥0.65. **(C)** Difference between $FFR_{LM\ apparent}$ and $FFR_{LM\ true}$ for epicardial lesions with an FFR <0.65. Abbreviations as in Figure 2.

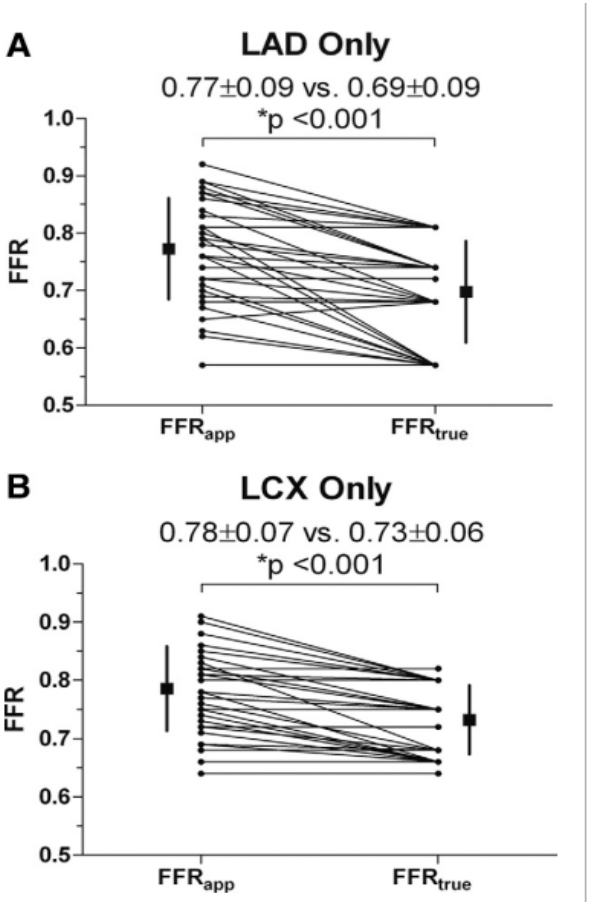


**Figure 4. Effect of LAD Disease Versus LCX Disease on Assessment of LM FFR**

**(A)** Difference between $FFR_{LM\ apparent}$ and $FFR_{LM\ true}$ for LAD stenoses. **(B)** Difference between $FFR_{LM\ apparent}$ and $FFR_{LM\ true}$ for LCX stenoses. Abbreviations as in Figures 1 and 2.

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## Intravascular Ultrasound-Derived Predictors for Fractional Flow Reserve in Intermediate Left Main Disease

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Gary S. Mintz, MD,† Cheol Whan Lee, MD, PhD,* Seong-Wook Park, MD, PhD,*
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- Quel est le cutt off du MLA pour les sténoses intermédiaires du TC ?
- 55 pts

**Table 2. Quantitative Coronary Angiographic and IVUS Findings in 55 Intermediate LM Lesions**

| | Total (N = 55) | FFR <0.80 (n = 26) | FFR ≥0.80 (n = 29) | p Value* |
|---|---|---|---|---|
| Quantitative coronary angiography | | | | |
| Angiographic ulceration | 5 (11%) | 3 (13%) | 2 (8%) | 0.601 |
| Proximal reference diameter, mm | 3.9 ± 0.6 | 3.8 ± 0.6 | 4.1 ± 0.6 | 0.174 |
| Distal reference diameter, mm | 3.5 ± 0.5 | 3.4 ± 0.4 | 3.7 ± 0.5 | 0.151 |
| Interpolated diameter, mm | 3.7 ± 0.5 | 3.6 ± 0.5 | 3.8 ± 0.4 | 0.063 |
| Minimal lumen diameter, mm | 2.0 ± 0.5 | 1.8 ± 0.5 | 2.1 ± 0.6 | 0.004 |
| Diameter stenosis, % | 47.7 ± 11.6 | 50.5 ± 12.6 | 44.8 ± 10.3 | 0.070 |
| Lesion length, mm | 10.8 ± 5.4 | 13.0 ± 5.2 | 8.8 ± 4.1 | 0.001 |
| IVUS findings | | | | |
| At MLA site within LM | | | | |
| MLA, $mm^2$ | 4.9 ± 2.4 | 3.4 ± 1.2 | 6.3 ± 2.3 | <0.001 |
| EEM area, $mm^2$ | 17.8 ± 5.5 | 16.8 ± 3.6 | 18.7 ± 6.7 | 0.202 |
| Plaque burden, % | 69.3 ± 15.4 | 77.5 ± 10.8 | 61.9 ± 15.6 | <0.001 |
| At the LAD ostium | | | | |
| MLA, $mm^2$ | 5.9 ± 2.3 | 5.6 ± 2.0 | 6.2 ± 2.6 | 0.396 |
| EEM area, $mm^2$ | 13.5 ± 3.8 | 12.8 ± 3.0 | 14.1 ± 4.3 | 0.230 |
| Plaque burden, % | 57.0 ± 15.4 | 56.9 ± 13.0 | 57.1 ± 17.8 | 0.566 |

Values are n (%) or mean ± SD. *Fractional flow reserve (FFR) <0.80 vs. FFR ≥0.80.
EEM = external elastic membrane; IVUS = intravascular ultrasound; LAD = left anterior descending coronary artery; LM = left main coronary artery; MLA = minimal lumen area.

JACC Interv 2011;4:1168-74.

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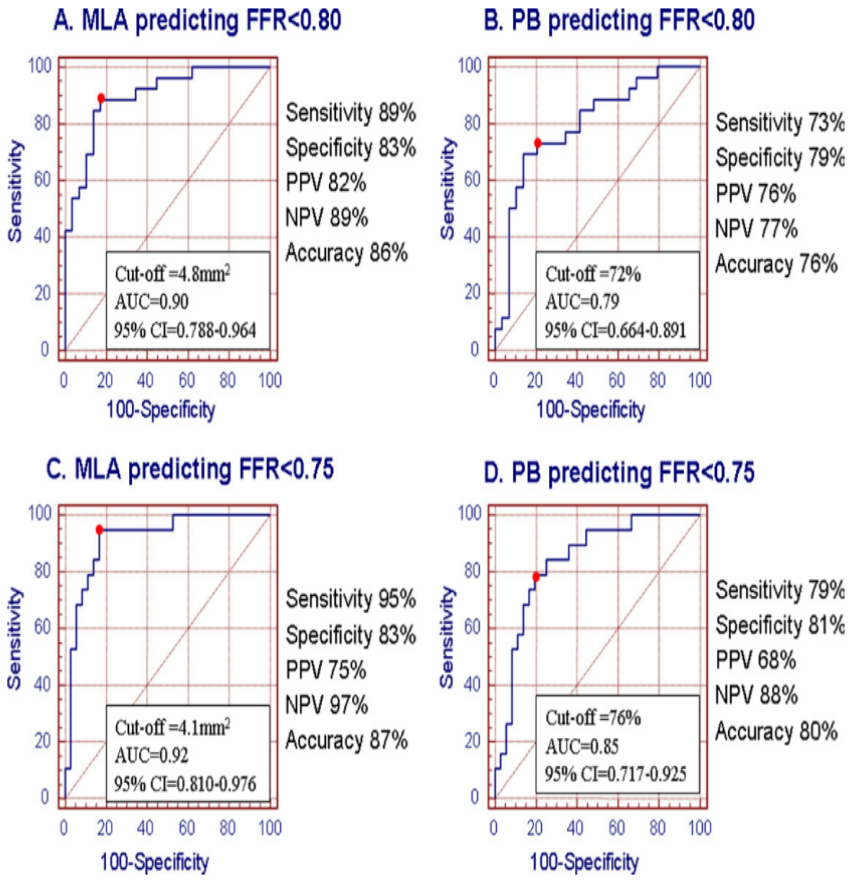
- 55 pts
- Quel est le meilleur critères IVUS avec une FFR comme gold standard ?




JACC Interv 2011;4:1168-74.

# Outcomes of Percutaneous Coronary Intervention in Intermediate Coronary Artery Disease

## Fractional Flow Reserve–Guided Versus Intravascular Ultrasound–Guided

Chang-Wook Nam, MD, PHD,* Hyuck-Jun Yoon, MD,* Yun-Kyeong Cho, MD, PHD,* Hyoung-Seob Park, MD,* Hyungseop Kim, MD, PHD,* Seung-Ho Hur, MD, PHD,* Yoon-Nyun Kim, MD, PHD,* In-Sung Chung, MD, PHD* Bon-Kwon Koo, MD, PHD,† Seung-Jae Tahk, MD, PHD,‡ William F. Fearon, MD,§ Kwon-Bae Kim, MD, PHD*

*Daegu, Seoul, and Suwon, Korea; and Stanford, California*

- PCI MLA décidée vs une PCI FFR décidée
- Mono centre
- 167 pts
- FFR 0.80
- MLA 4.0 mm

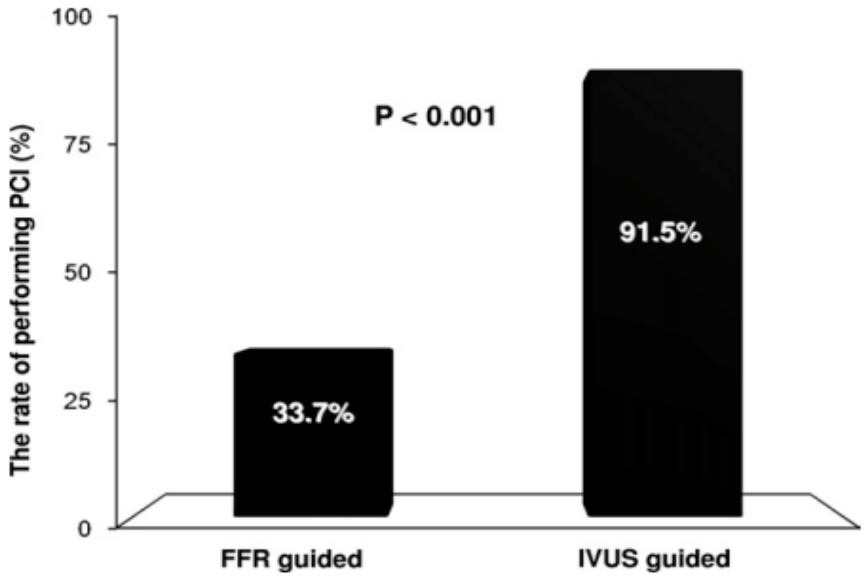



**Figure 1. The Rate of Performing PCI According to Type of Guiding Device**

The fractional flow reserve (FFR)–guided group showed significantly lower rates of performing percutaneous coronary intervention (PCI) compared to the intravascular ultrasound (IVUS)–guided group.

JACC Interv. 2010;3:12-7

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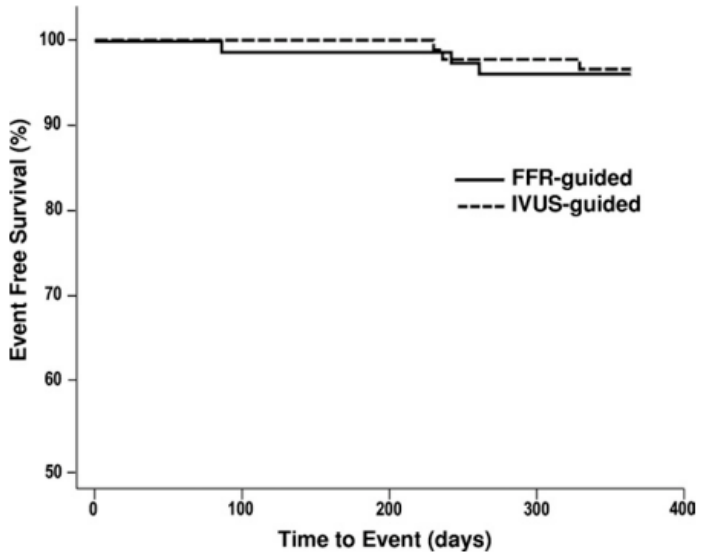



**Figure 3. Kaplan-Meier Survival Curves for Freedom From Adverse Cardiac Events During 12 Months of Follow-Up**

Kaplan-Meier survival curves for freedom from adverse cardiac events during 12 months of follow-up for both groups. p > 0.05. Abbreviations as in Figure 1.

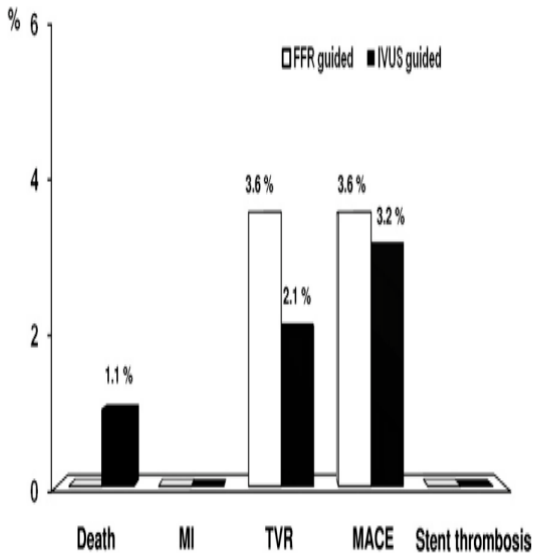



**Figure 2. 1-Year Clinical Outcomes According to the Type of Guiding Device**

The FFR- and IVUS-guided groups demonstrated excellent 12-month clinical outcomes without significant between-group differences. All p values were >0.05. MACE = major adverse cardiac event; MI = myocardial infarction; TVR = target vessel revascularization; other abbreviations as in Figure 1.

JACC Interv. 2010;3:12-7

# Long-Term Clinical Outcome After Fractional Flow Reserve–Guided Treatment in Patients With Angiographically Equivocal Left Main Coronary Artery Stenosis

Michalis Hamilos, MD, PhD*; Olivier Muller, MD, PhD*; Thomas Cuisset, MD; Argyrios Ntalianis, MD, PhD; Gregory Chlouverakis, PhD; Giovanna Sarno, MD; Olivier Nelis, RN; Jozef Bartunek, MD, PhD; Marc Vanderheyden, MD; Eric Wyffels, MD; Emanuele Barbato, MD, PhD; Guy R. Heyndrickx, MD, PhD; William Wijns, MD, PhD; Bernard De Bruyne, MD, PhD

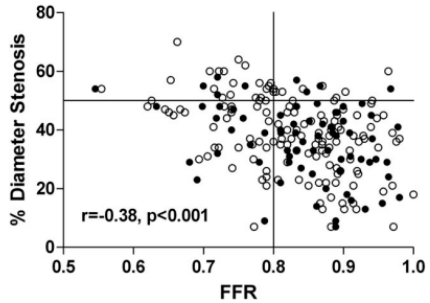
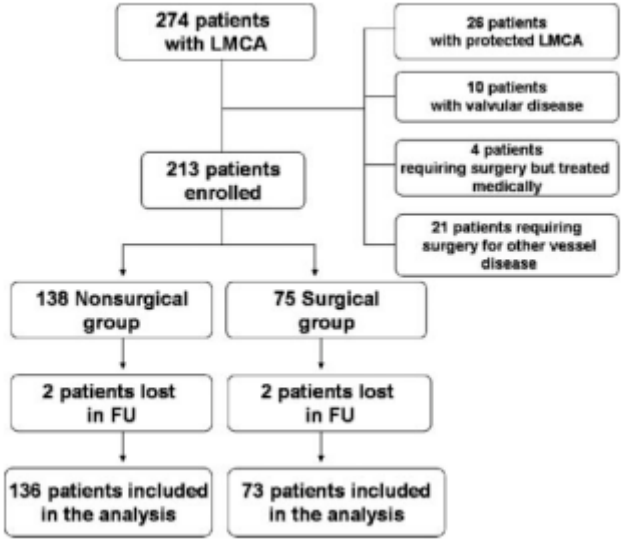



**Figure 2.** Scatterplots showing the distribution of percent DS and the corresponding FFR values. The dots represent patients with isolated LMCA stenosis.



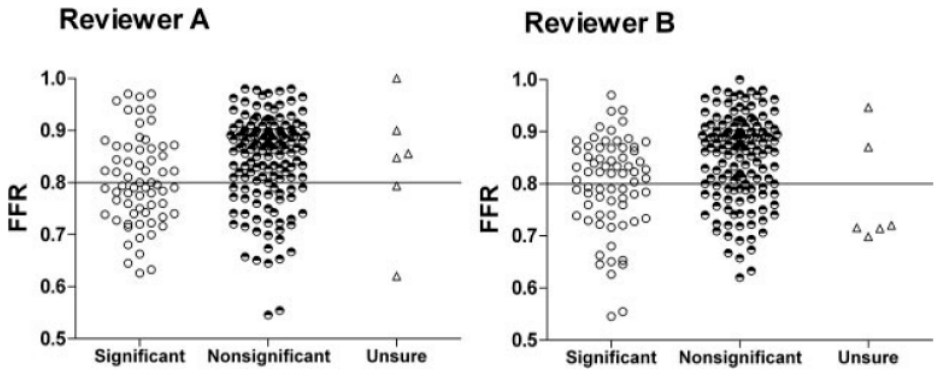




**Figure 4.** Relation between FFR values and the 2 reviewers' visual estimations (lesions were classified as significant, nonsignificant, and unsure).

Circulation 2009;120:1505-1512

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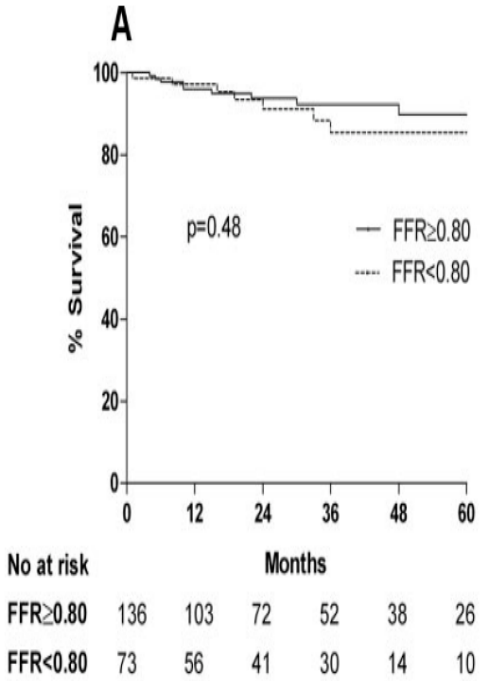


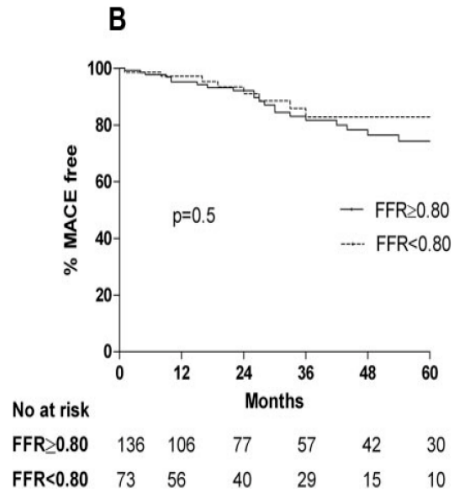
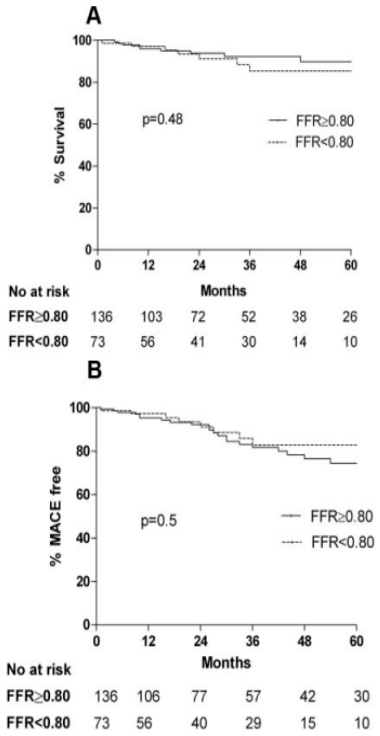




**Figure 5.** Kaplan–Meier mortality curves showing percent survival (A) and major adverse cardiac events (MACE; B) in the 2 study groups. There is no difference between the nonsurgical and surgical groups.

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Circulation 2009;120:1505-1512

# FIRST: Fractional Flow Reserve and Intravascular Ultrasound Relationship Study

Ron Waksman, MD,* Jacek Legutko, MD,† Jasvindar Singh, MD,‡ Quentin Orlando, DO,§
Steven Marso, MD,‖ Timothy Schloss, MD,¶ John Tugaoen, MD,# James DeVries, MD,**
Nicholas Palmer, MD,†† Michael Haude, MD,‡‡ Stacy Swymelar, BS,* Rebecca Torguson, MPH*

*Washington, DC; Krakow, Poland; St. Louis, Kansas City, Washington, Missouri; Erie, Pennsylvania; Columbus, Ohio; Lebanon, New Hampshire; Liverpool, United Kingdom; and Neuss, Germany*

- FFR est le gold standard
- Multicentrique , prospective
- 350 pts
- Quelle est la valeur du MLA optimal dans l' évaluation des sténoses intermédiaires ?

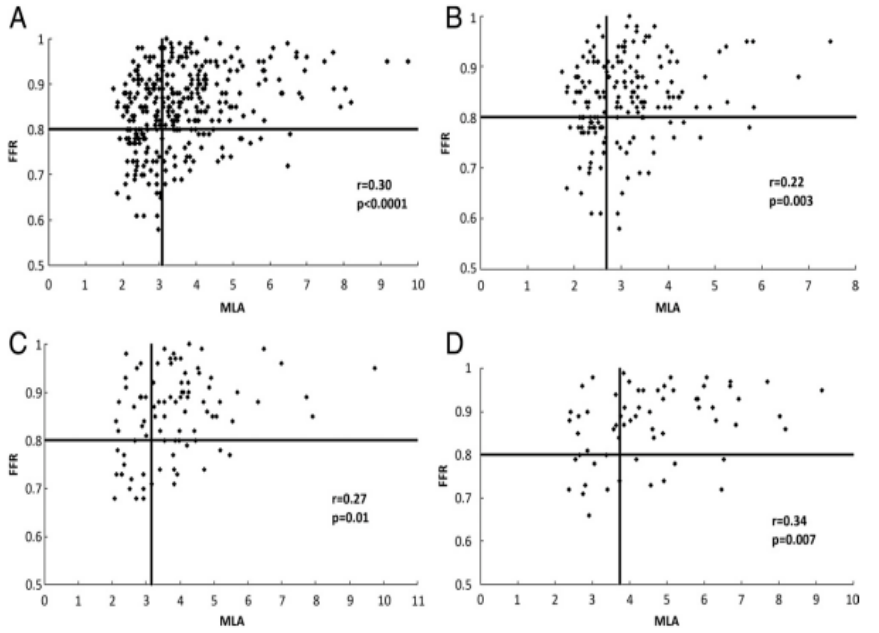


**Figure 1** Scatterplots of Intravascular Ultrasound MLA and FFR

**(A)** All reference vessel diameters (RVDs), as defined by the angiographic core laboratory, with fractional flow reserve (FFR) of 0.8 and minimal lumen area (MLA) cutoff of 3.07 $mm^2$ marked. **(B)** RVD <3.0 mm with an FFR of 0.8 and an MLA cutoff of 2.68 $mm^2$ marked. **(C)** RVDs 3.0 to 3.5 mm with an FFR of 0.8 and an MLA cutoff of 3.16 $mm^2$ marked. **(D)** RVDs >3.5 mm with an FFR of 0.8 and an MLA cutoff of 3.74 $mm^2$ marked.

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- La valeur du MLA doit être corrélée au diamètre de référence du vaisseau
- Même avec cette analyse La précision diagnostic du MLA est faible

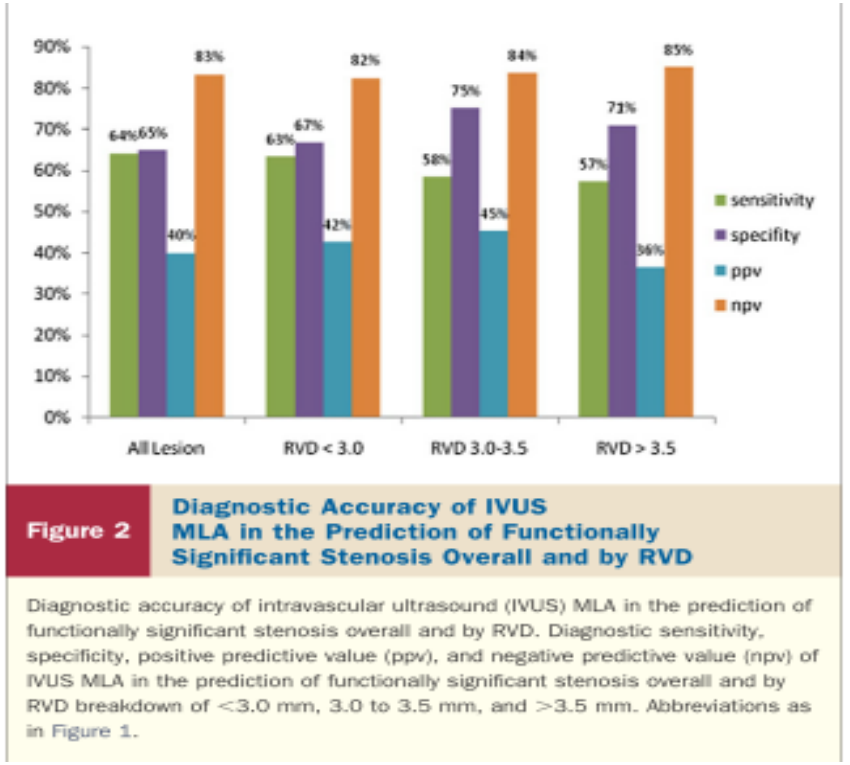


**Figure 2** Diagnostic Accuracy of IVUS MLA in the Prediction of Functionally Significant Stenosis Overall and by RVD

Diagnostic accuracy of intravascular ultrasound (IVUS) MLA in the prediction of functionally significant stenosis overall and by RVD. Diagnostic sensitivity, specificity, positive predictive value (ppv), and negative predictive value (npv) of IVUS MLA in the prediction of functionally significant stenosis overall and by RVD breakdown of <3.0 mm, 3.0 to 3.5 mm, and >3.5 mm. Abbreviations as in Figure 1.

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# CONCLUSION

- L’ évaluation des sténoses intermédiaires du tronc commun de l artère coronaire gauche reste un exercice difficile avec un important mismatch angio FFR
- L évaluation du tronc commun par la FFR doit tenir compte des lésions prox de iva et ou cx
- L IVUS a un intérêt pour évaluer la morphologie de la sténose pas pour décider une revascularisation
- La FFR  devrait être systématiquement utilisée devant une sténose intermédiaire du TC avant d adopter une stratégie de revascularisation.