

# **FFR vs. Angiography for Multivessel Evaluation**

## **FAME *2 Year Follow-Up***

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Uwe Siebert and Nico H.J. Pijls,  
on behalf of the FAME Study Investigators*

# Disclosure Statement of Financial Interest

**I, William Fearon, DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.**



# Background

- **Ischemia-producing coronary lesions cause symptoms and cardiac events.**
- **Coronary stenoses not responsible for ischemia can be safely treated medically.**
- **A primary goal of PCI is to relieve myocardial ischemia, resulting in fewer symptoms and cardiac events.**



# Background

- The angiographic severity of a coronary stenosis correlates poorly with its ischemic potential.
- The current strategy of performing PCI based on the angiographic appearance of a lesion may not be the most effective or efficient technique.
- Measuring fractional flow reserve (FFR) to help identify which lesions warrant PCI may be a superior method for achieving a “functionally” complete revascularization.



# Background

- The FAME study is a multicenter, international, randomized trial comparing an FFR-guided approach to PCI in patients with multivessel CAD to an angiography-guided strategy.
- At TCT 2008, we presented the 1 year results from FAME demonstrating a significant decrease in MACE in the patients randomized to FFR guidance.
- The durability of this benefit is the subject of this two-year follow-up of the FAME study.



# Methods

- **Inclusion Criteria:**
  - **Patients with lesions in 2 or all 3 major epicardial vessels, which were  $\geq 50\%$  narrowed *and* which the operator deemed warranted PCI based on the angiographic appearance and the clinical data available.<sup>1,2</sup>**

1. Fearon, et al. Am Heart J 2007;154:632-6.
2. Tonino, et al. New Engl J Med 2009;360:213-24.



# Methods

- **Exclusion Criteria:**
  - **Angiographically significant left main disease**
  - **Previous CABG**
  - **Recent ST elevation MI (<5 days)**
  - **Cardiogenic shock**
  - **Extremely tortuous or calcified vessels**



# Flow Chart

## **FFR-Guided**

**PCI performed on indicated lesions only if FFR  $\leq 0.80$**

**Lesions warranting PCI identified**

## **Angio-Guided**

**PCI performed on indicated lesions**

**Randomized**

## **Primary Endpoint**

**Composite of death, MI and repeat revasc. (MACE) at 1 year**

## **Key Secondary Endpoints**

**Individual rates of death, MI, and repeat revasc., MACE, and functional status at 2 years**



# Participating Centers

## EUROPE (14)

Cardiovascular Center, Aalst (*B. de Bruyne*)

Catharina Hospital, Eindhoven (*N. Pijls*)

Rigshospitalet, Copenhagen (*T. Engstrom*)

Klinikum der Universitat Munchen (*V. Klauss*)

Aarhus University Hospital (*O. Frobert*)

University Hosp Bergmannsheil (*W. Bojara*)

Sodersjukhuset, Stockholm (*I. Herzfeld*)

Helsingborgs Lasarett (*F. Schersten*)

Klinikum Darmstadt (*G. Werner*)

Bristol Royal Infirmary (*A. Baumbach*)

Staedt. Krankenhaus, Bogenhausen (*G. Riess*)

Glasgow Western Infirmary (*K. Oldroyd*)

Royal Victoria Hosp, Belfast (*G. Manoharan*)

King's College Hosp, London (*P. MacCarthy*)

## USA (6)

Stanford University

(*W. Fearon*)

Northeast Cardiology, Bangor, ME

(*P. Verlee*)

St Louis University

(*M. Lim*)

University of Louisville

(*M. Leesar*)

University of South Carolina

(*E. Powers*)

University of Virginia

(*M. Ragosta*)



# Organization

## ***Major Sponsor:***

Radi Medical System / St. Jude Medical

## ***Steering Committee:***

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Bernard De Bruyne, Aalst, Belgium

Pim A.L. Tonino, Eindhoven, Netherlands

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Mamdouh El Gamal, Eindhoven, NL

Morton Kern, Irvine, CA, USA

John Hodgson, Wilkes Barre, PA, USA



# Baseline Characteristics

	<b>Angio- Guided n = 496</b>	<b>FFR- Guided n = 509</b>	<b>P Value</b>
<b>Age, mean <math>\pm</math>SD</b>	64 $\pm$ 10	65 $\pm$ 10	0.47
<b>Male, %</b>	73	75	0.30
<b>Diabetes, %</b>	25	24	0.65
<b>Hypertension, %</b>	66	61	0.10
<b>Current smoker, %</b>	32	27	0.12
<b>Hyperlipidemia, %</b>	73	72	0.62
<b>Previous MI, %</b>	36	37	0.84
<b>NSTE ACS, %</b>	36	29	0.11
<b>Previous PCI, %</b>	26	29	0.34
<b>LVEF, mean <math>\pm</math>SD</b>	57 $\pm$ 12	57 $\pm$ 11	0.92
<b>LVEF &lt; 50%, %</b>	27	29	0.47



# Procedural Characteristics

	Angio- Guided n = 496	FFR- Guided n = 509	P Value
Indicated lesions / patient	2.7±0.9	2.8±1.0	0.34
Stents / patient	2.7 ± 1.2	1.9 ± 1.3	<0.001



# Procedural Characteristics

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<b>Stents / patient</b>	2.7 ± 1.2	1.9 ± 1.3	<0.001
<b>Procedure time (min)</b>	70 ± 44	71 ± 43	0.51
<b>Contrast agent used (ml)</b>	302 ± 127	272 ± 133	<0.001
<b>Equipment cost (US \$)</b>	6007	5332	<0.001
<b>Length of hospital stay (days)</b>	3.7 ± 3.5	3.4 ± 3.3	0.05

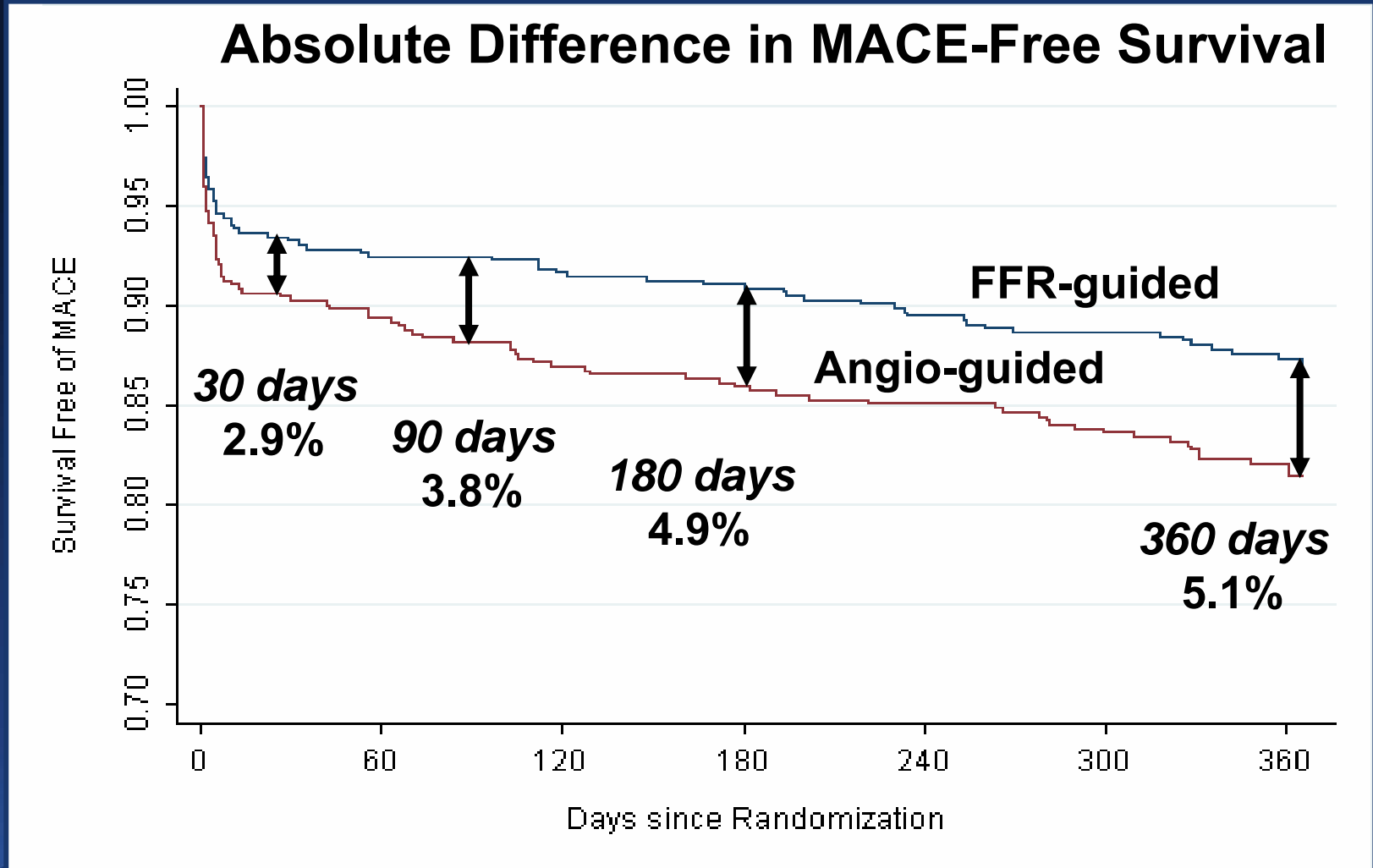


# Adverse Events at 1 Year

	Angio- Guided n = 496	FFR- Guided n = 509	P Value
<b>Total no. of MACE</b>	113	76	
Death	15 (3.0)	9 (1.8)	0.19
Myocardial Infarction	43 (8.7)	29 (5.7)	0.07
Small / peri-PCI (CK-MB 3-5xNI)	16	12	
Other infarctions (“late or large”)	27	17	
CABG or repeat PCI	47 (9.5)	33 (6.5)	0.08
Death or Myocardial Infarction	55 (11.1)	37 (7.3)	0.04
<b>Death, MI, CABG, or re-PCI</b>	<b>91 (18.3)</b>	<b>67 (13.2)</b>	<b>0.02</b>



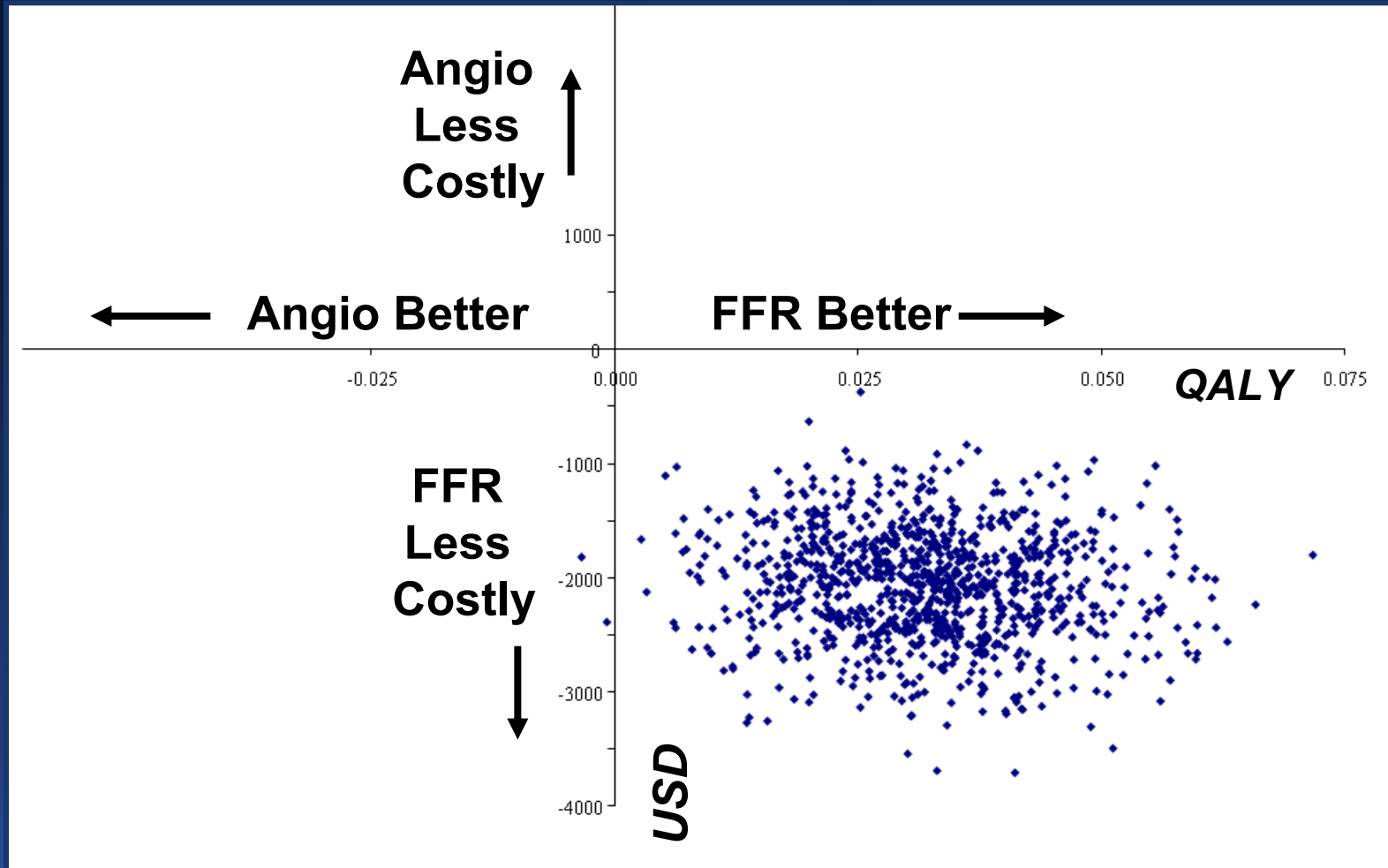
# 1 Year Event-Free Survival





# 1 Year Economic Evaluation

*Bootstrap Simulation*





# Adverse Events at 2 Years

**Angio-  
Guided**  
n = 496

**FFR-  
Guided**  
n = 509

**P  
Value**



# Adverse Events at 2 Years

	Angio-Guided n = 496	FFR-Guided n = 509	P Value
<b>Total no. of MACE</b>	139	105	





# Adverse Events at 2 Years

	Angio-Guided n = 496	FFR-Guided n = 509	P Value
Total no. of MACE	139	105	
<i>Individual Endpoints</i>			



# Adverse Events at 2 Years

	Angio-Guided n = 496	FFR-Guided n = 509	P Value
<b>Total no. of MACE</b>	139	105	
<b><i>Individual Endpoints</i></b>			
Death	19 (3.8)	13 (2.6)	0.25



# Adverse Events at 2 Years

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<b>Total no. of MACE</b>	139	105	
<b><i>Individual Endpoints</i></b>			
Death	19 (3.8)	13 (2.6)	0.25
Myocardial Infarction	48 (9.7)	31 (6.1)	0.03



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<b>Total no. of MACE</b>	139	105	
<b><i>Individual Endpoints</i></b>			
Death	19 (3.8)	13 (2.6)	0.25
Myocardial Infarction	48 (9.7)	31 (6.1)	0.03
CABG or repeat PCI	61 (12.3)	53 (10.4)	0.35



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<b><i>Composite Endpoints</i></b>			



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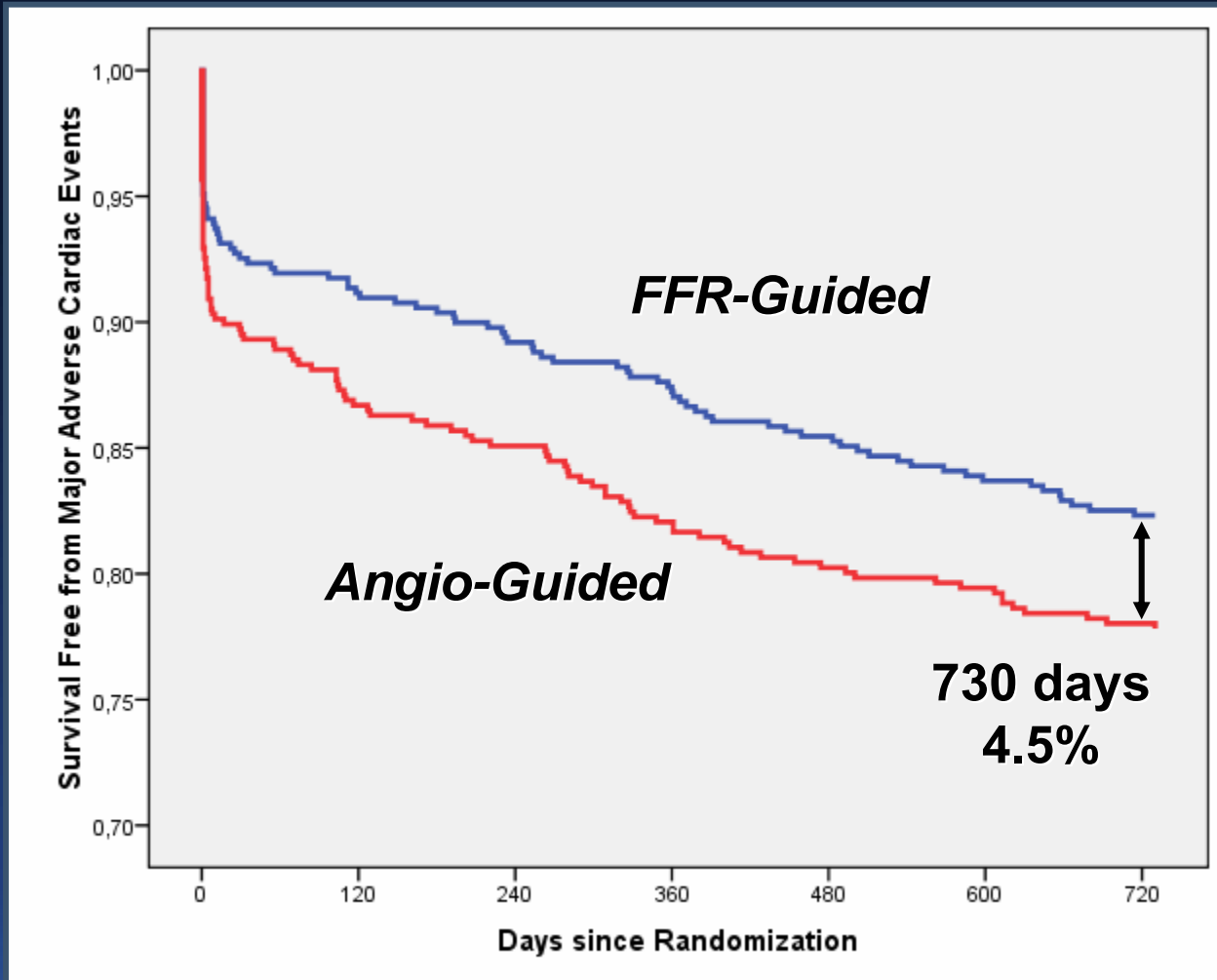


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<b><i>Composite Endpoints</i></b>			
Death or Myocardial Infarction	63 (12.7)	43 (8.4)	0.03
Death, MI, CABG, or re-PCI	110 (22.2)	90 (17.7)	0.07

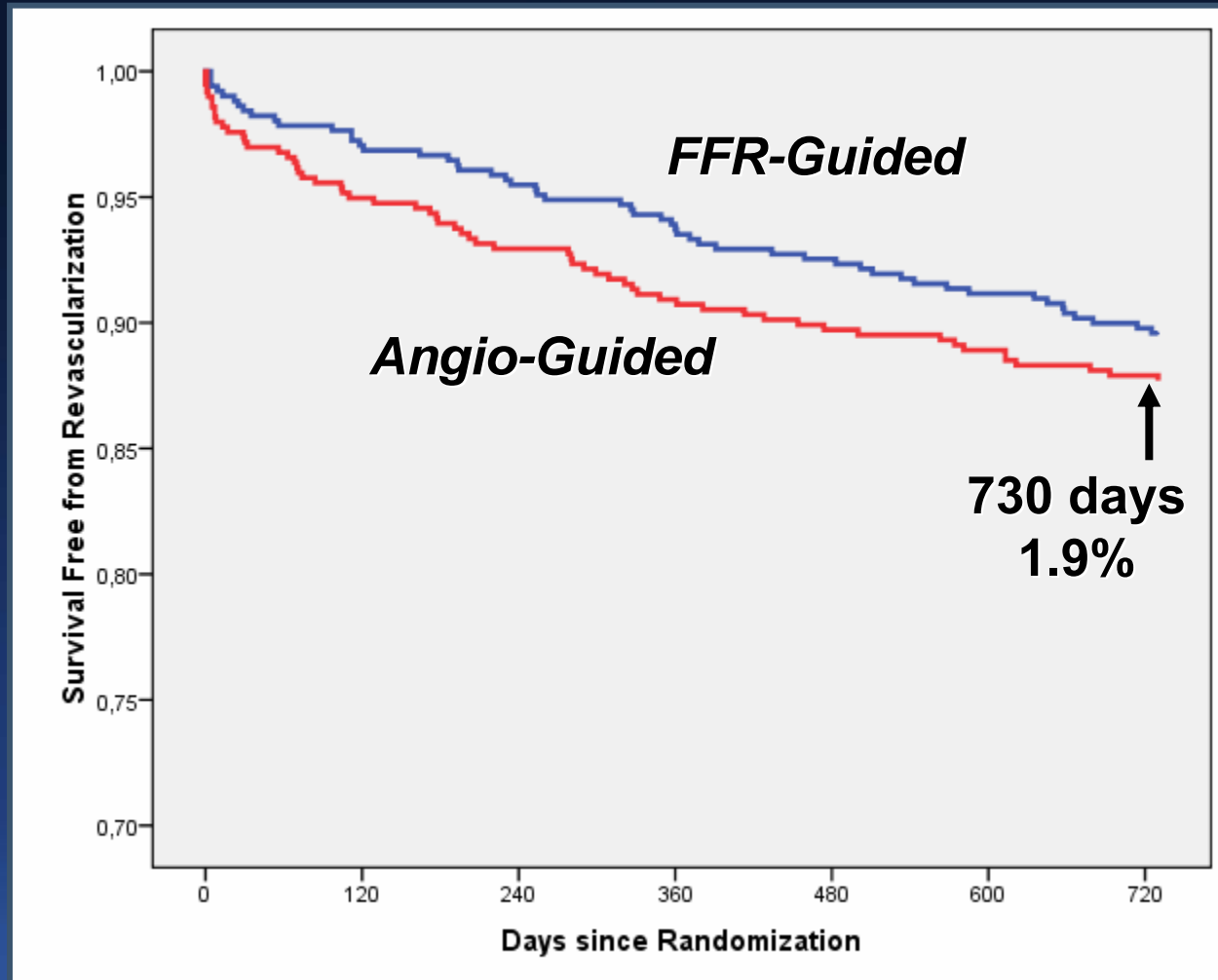


# 2 Year Survival Free of MACE



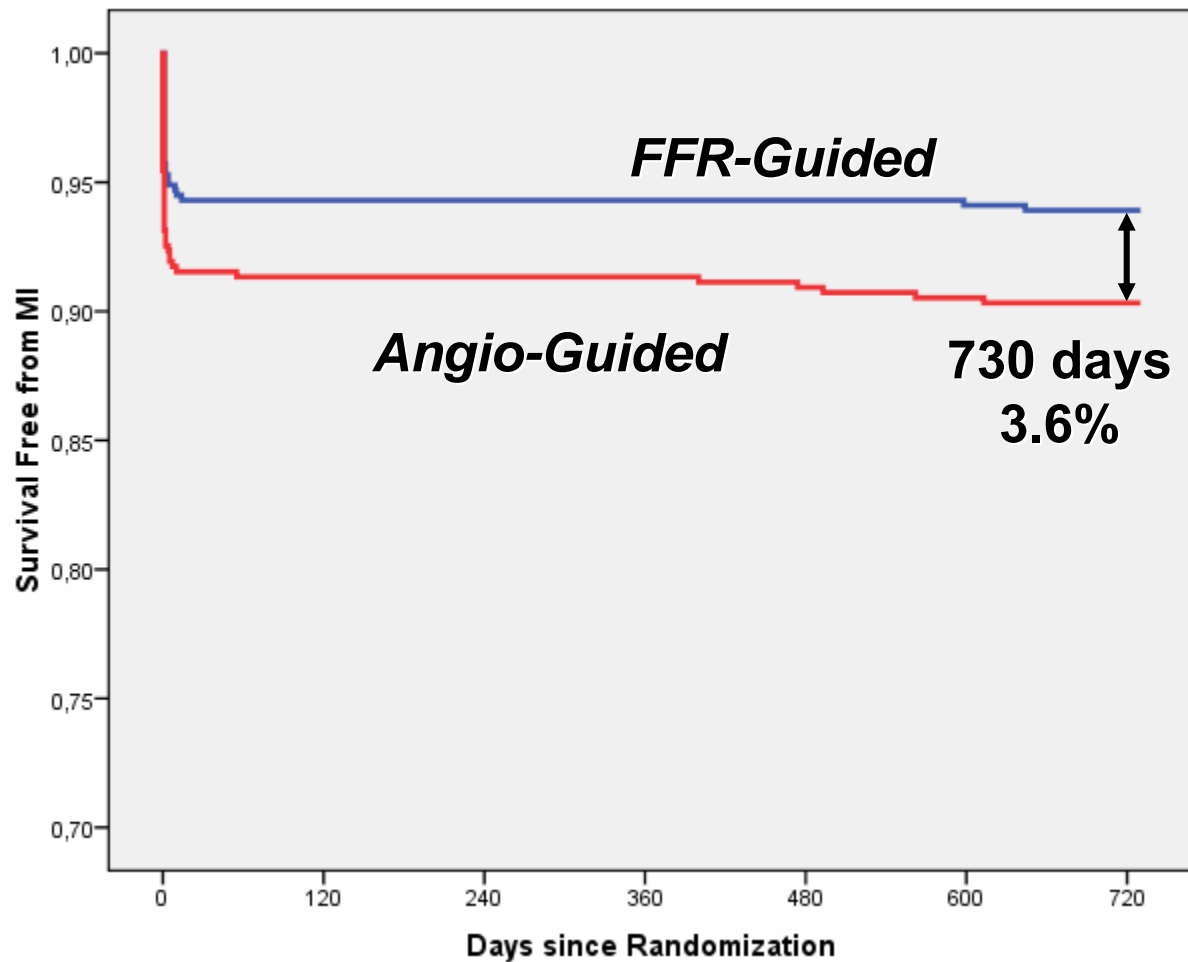


# 2 Year Survival Free of Repeat Revascularization



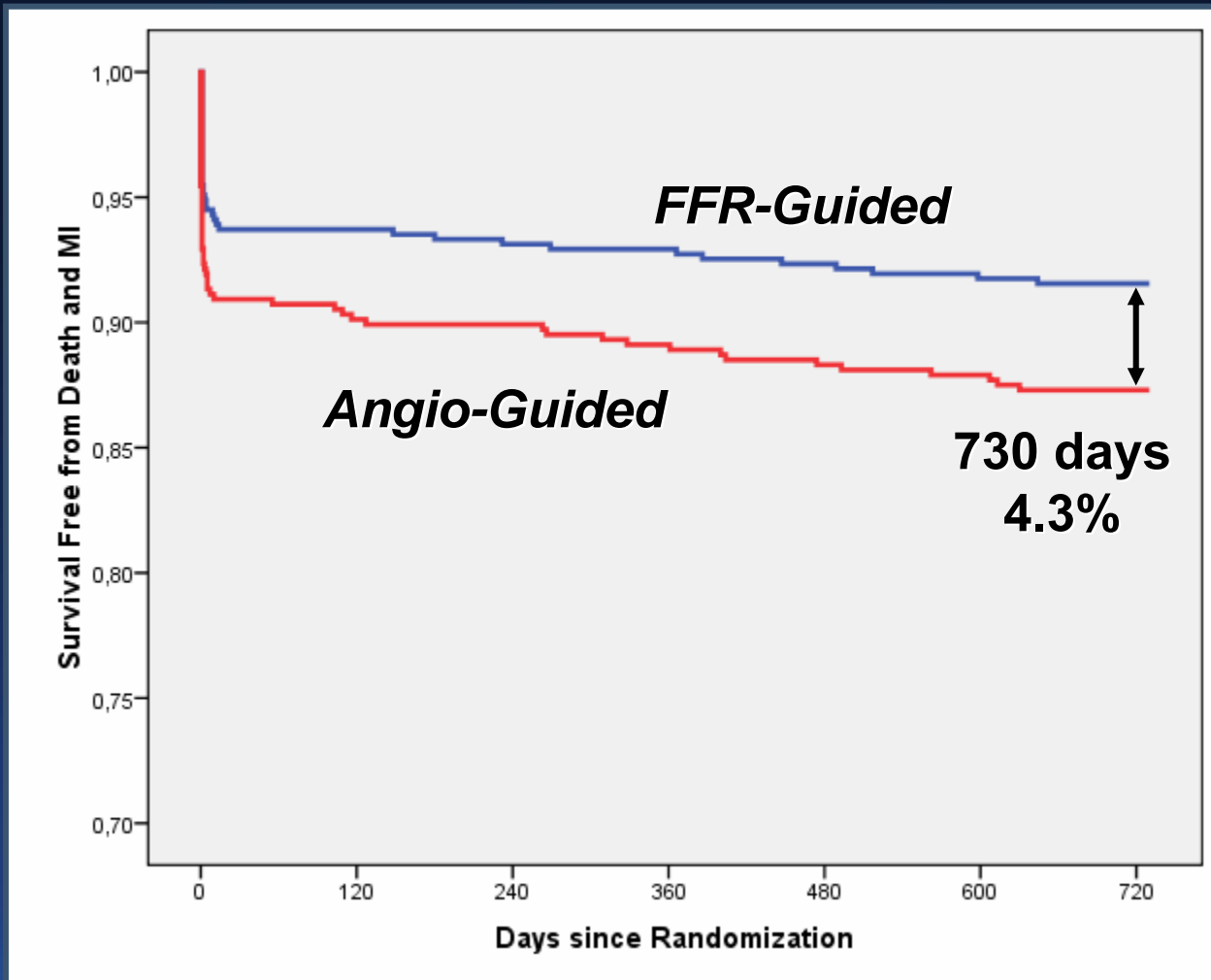


# 2 Year Survival Free of MI





# 2 Year Survival Free of Death/MI



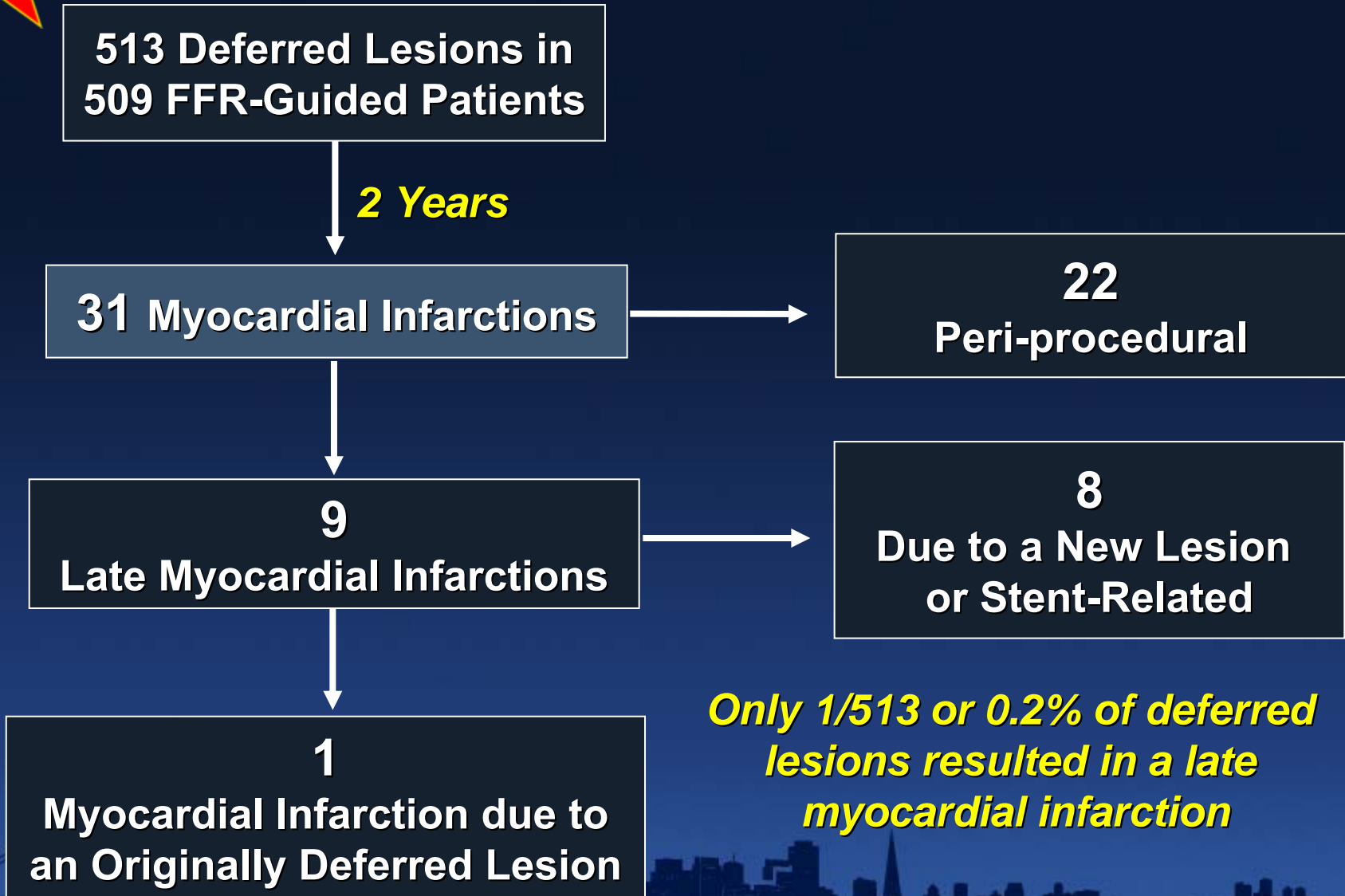


# Other 2 Year Outcomes

	Angio-Guided n = 496	FFR-Guided n = 509	P Value
Follow-up (%)	92.7	94.5	0.31
Anti-anginal Medications, No.	1.2 ±0.8	1.2 ±0.7	0.66
Dual Antiplatelet Therapy (%)	33.6	31.4	0.49
Freedom from Angina, (%)	75.8	79.9	0.14



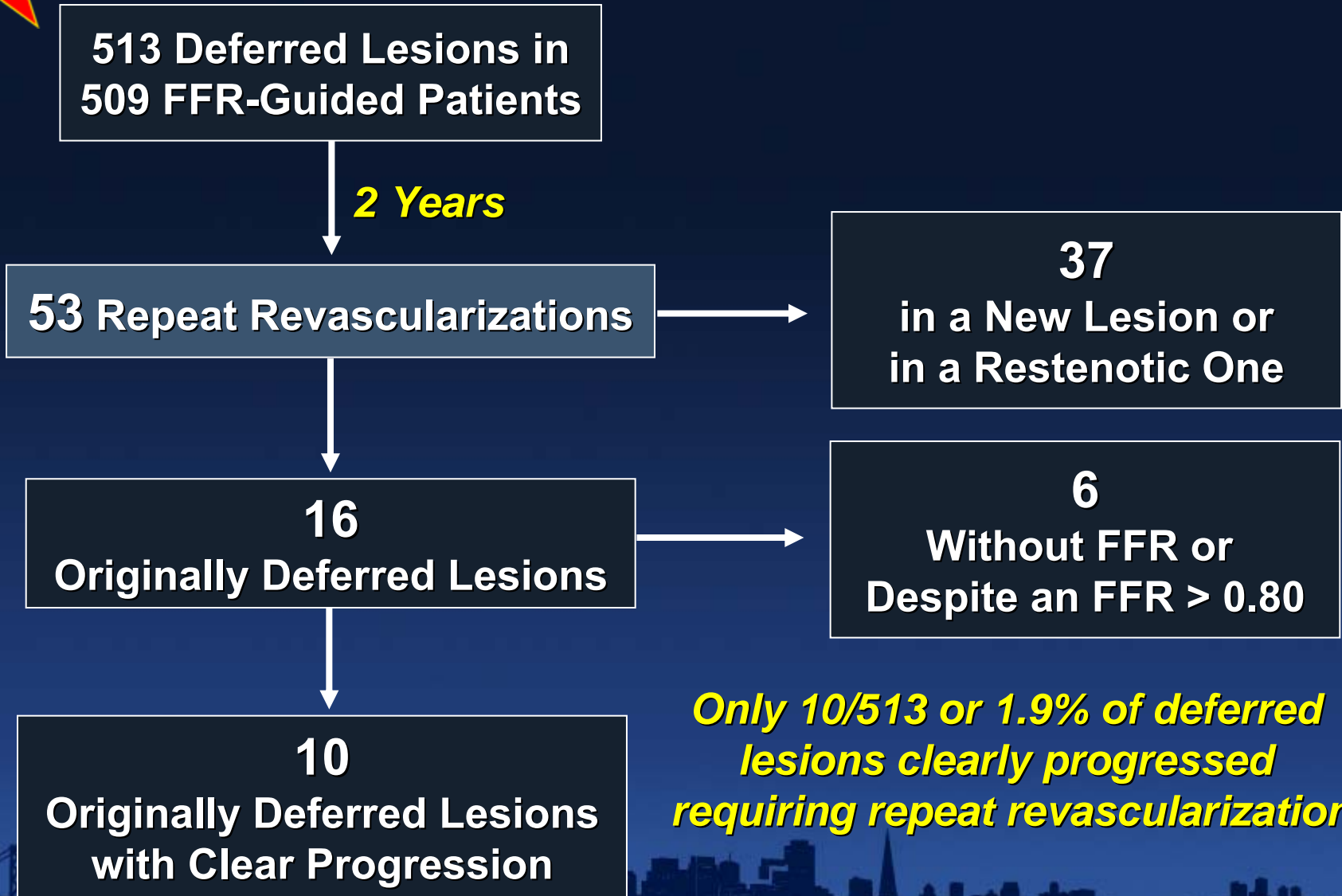
# Outcome of Deferred Lesions



*Only 1/513 or 0.2% of deferred lesions resulted in a late myocardial infarction*



# Outcome of Deferred Lesions





# Conclusions

- **At 2 years, there is now a significant decrease in the rate of MI in the FFR-guided arm. There continues to be a significant decrease in death and MI favoring the FFR-guided approach. Lastly, there is a strong trend towards a lower rate of death, MI or the need for repeat revascularization in the FFR-guided arm.**
- **There is no signal to suggest that deferred lesions are likely to be responsible for late myocardial infarctions or to progress and require repeat revascularizations.**



# Conclusions

- The 2 year follow-up of the FAME study demonstrates durability of the improved outcomes noted at 1 year with an FFR-guided approach to PCI in patients with multivessel CAD
- These results continue to support the evolving paradigm of:

***“Functionally Complete Revascularization”***

***i.e. stenting of ischemic lesions and  
medical treatment of non-ischemic ones***