O uso do FFR é capaz de mudar o prognóstico do paciente?

Mesa Redonda em Coronariopatia Crônica
29.º Congresso de Cardiologia do Estado da Bahia

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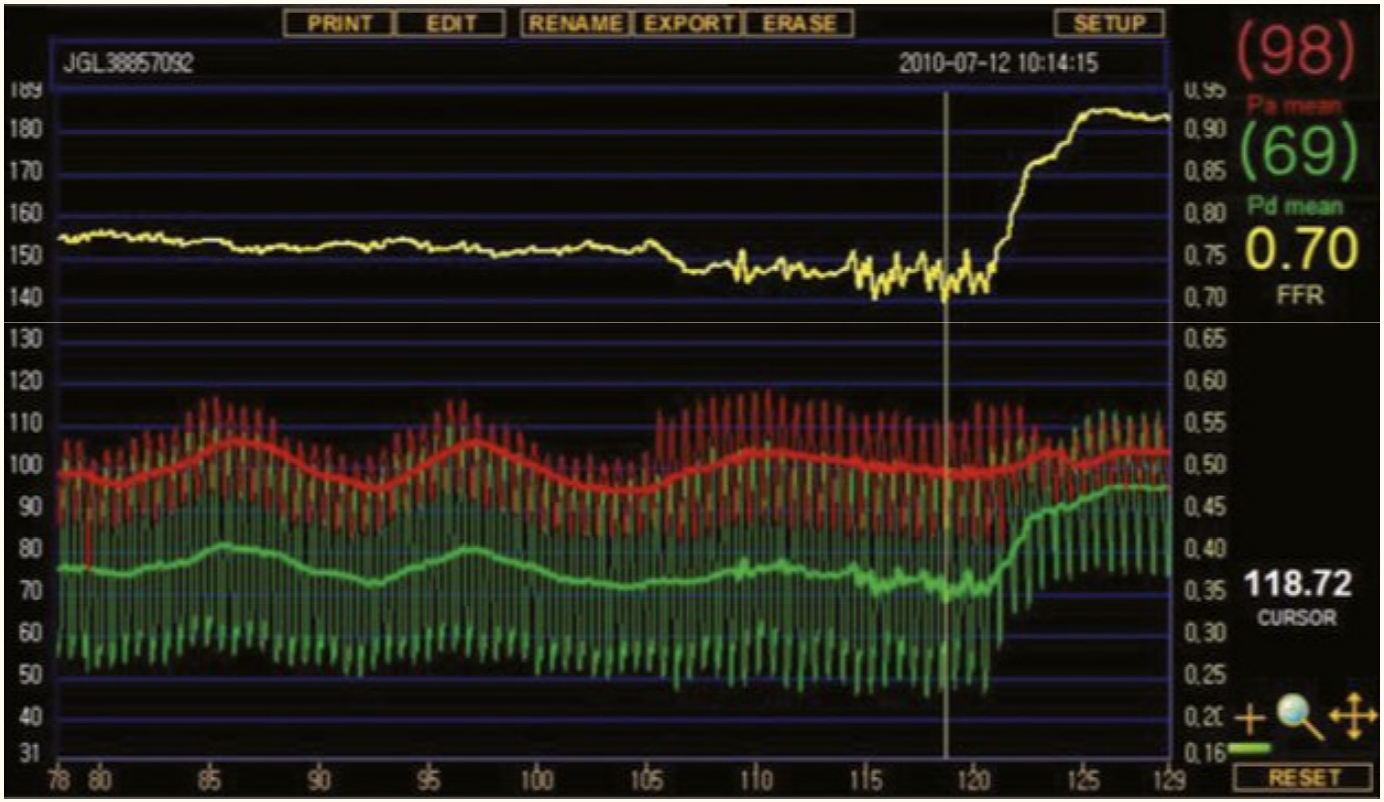
Hospital da Bahia

RESOLUÇÃO CFM 1595/2000

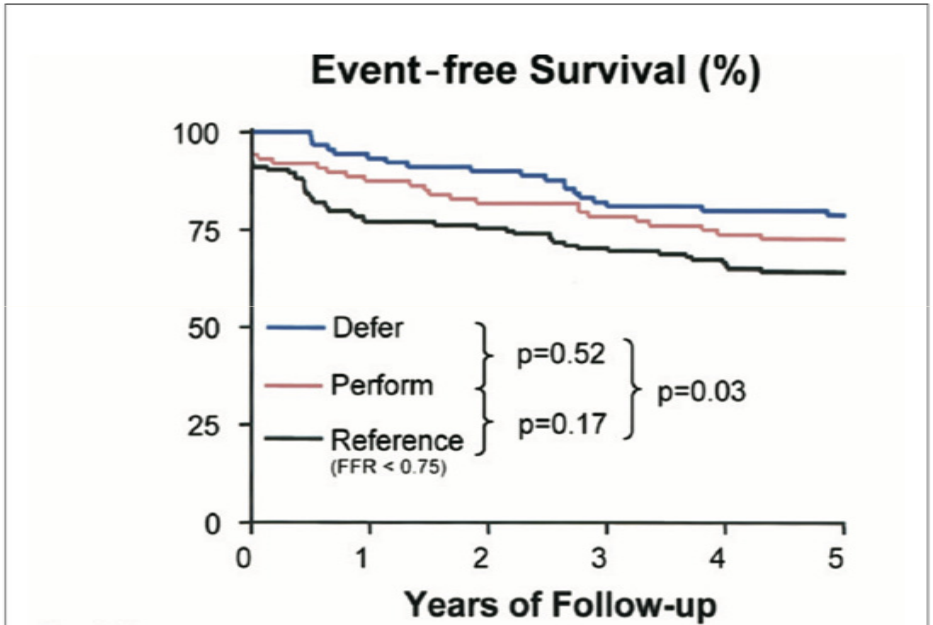
DECLARO NÃO POSSUIR CONFLITOS DE INTERESSES RELEVANTES PARA O TEMA

F.F.R. = FRACTIONAL FLOW RESERVE

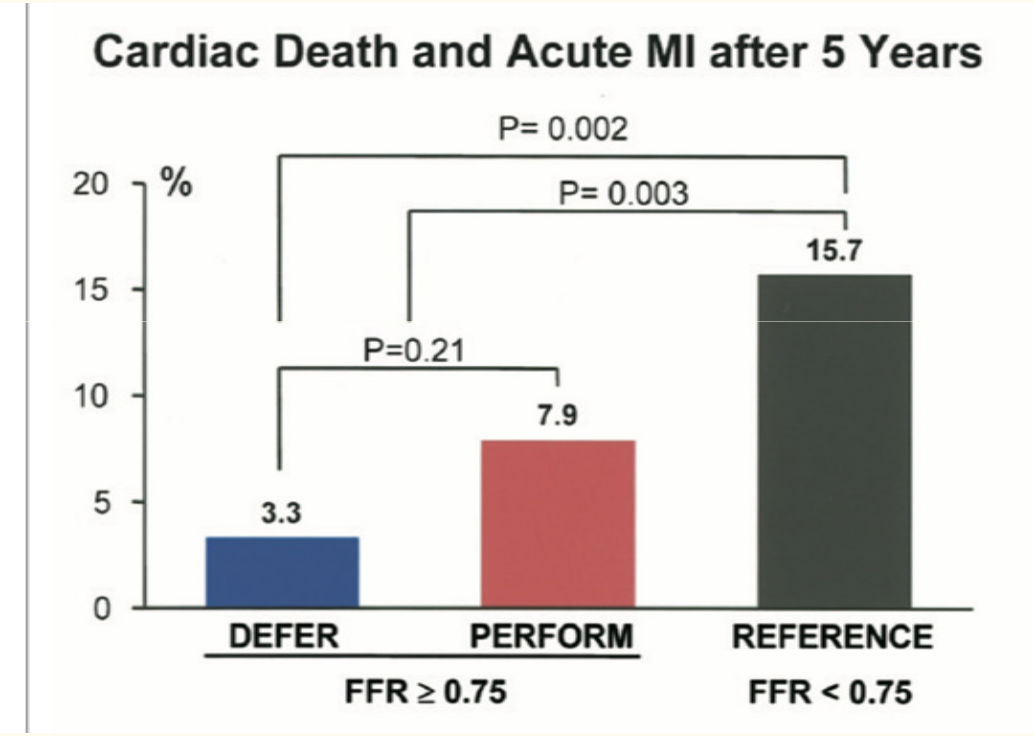


PROGNÓSTICO = MORTALIDADE???
(*QUOD VITAM*)

ESTUDO DEFER



ESTUDO DEFER



PIJLS ET AL. PERCUTANEOUS REVASCULARIZATION OF FUNCTIONALLY NONSIGNIFICANT STENOSIS. J Am Coll Cardiol 2007;49:2105–11.

ESTUDO FAME - 2 ANOS

Table 3 End Points at 2 Years

	Angiography Group (n = 496)	FFR Group (n = 509)	p Value*	RR With FFR Guidance (95% CI)
Events at 2 yrs				
Total number of events	142	106		
Number of events per patient	0.29 ± 0.60	0.21 ± 0.48	0.17	
Death	19 (3.8)	13 (2.6)	0.25	0.67 (0.33–1.34)
Myocardial infarction	49 (9.9)	31 (6.1)	0.03	0.62 (0.40–0.95)
CABG or repeat PCI	63 (12.7)	54 (10.6)	0.30	0.84 (0.59–1.18)
Death or myocardial infarction	64 (12.9)	43 (8.4)	0.02	0.65 (0.45–0.94)
Death, myocardial infarction, CABG, or repeat PCI	111 (22.4)	91 (17.9)	0.08	0.80 (0.62–1.02)
Functional status at 2 yrs				
Patients without event and free from angina†	284 (64.8)	315 (68.2)	0.29	
Patients free from angina†	332 (75.8)	369 (79.9)	0.14	
Number of antianginal medications‡	1.2 ± 0.8	1.2 ± 0.7	0.68	

ESTUDO FAME

JACC Vol. 56, No. 3, 2010
July 13, 2010:177–84

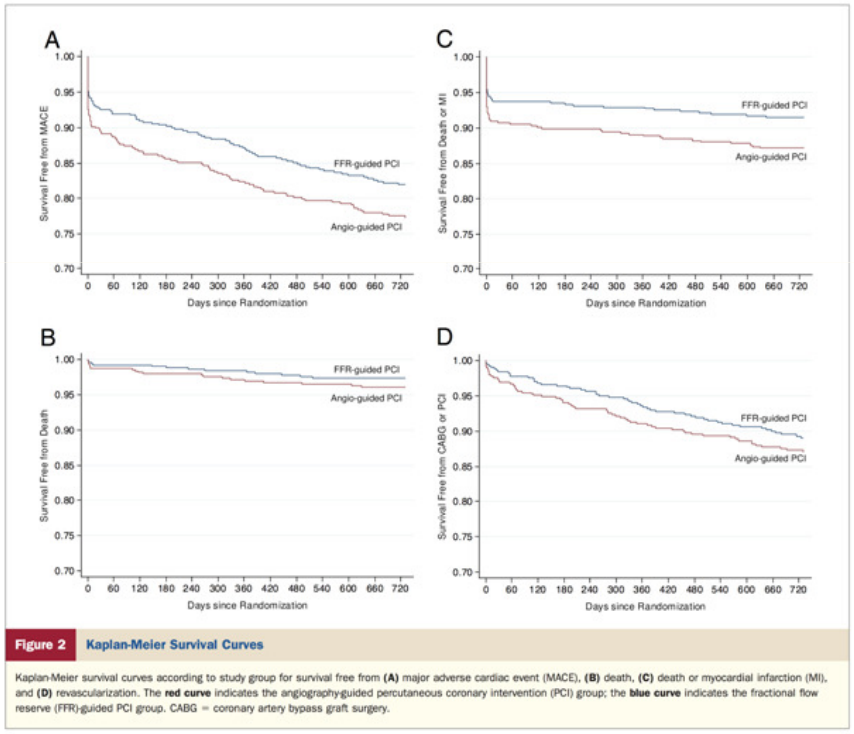


Figure 2 Kaplan-Meier Survival Curves

Kaplan-Meier survival curves according to study group for survival free from **(A)** major adverse cardiac event (MACE), **(B)** death, **(C)** death or myocardial infarction (MI), and **(D)** revascularization. The **red curve** indicates the angiography-guided percutaneous coronary intervention (PCI) group; the **blue curve** indicates the fractional flow reserve (FFR)-guided PCI group. CABG = coronary artery bypass graft surgery.

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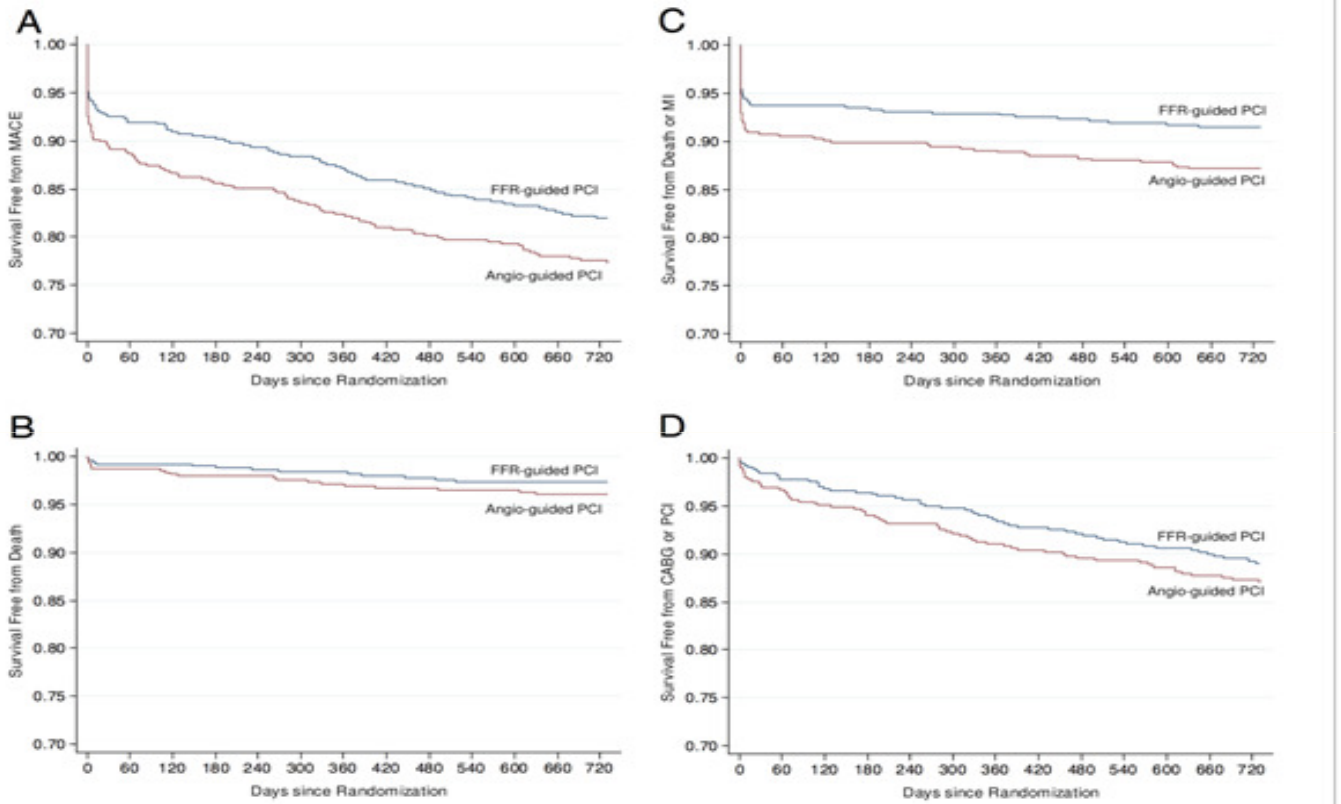
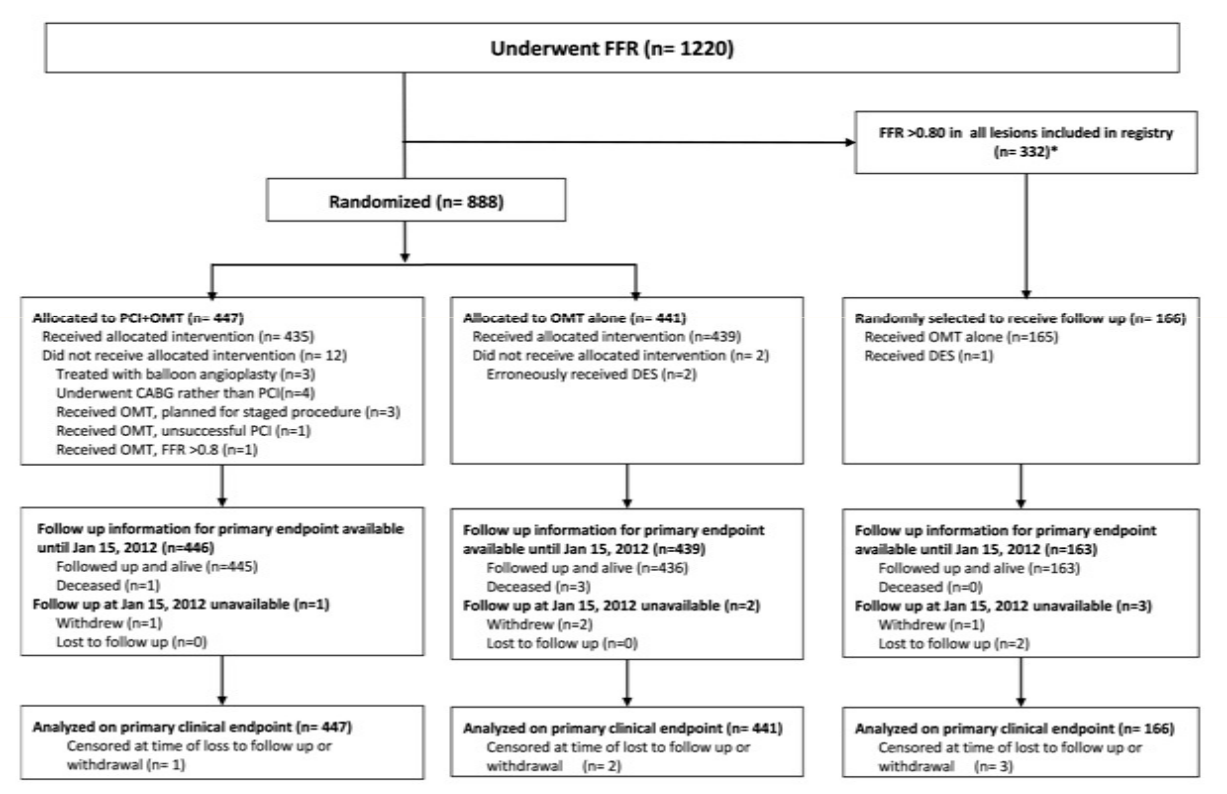


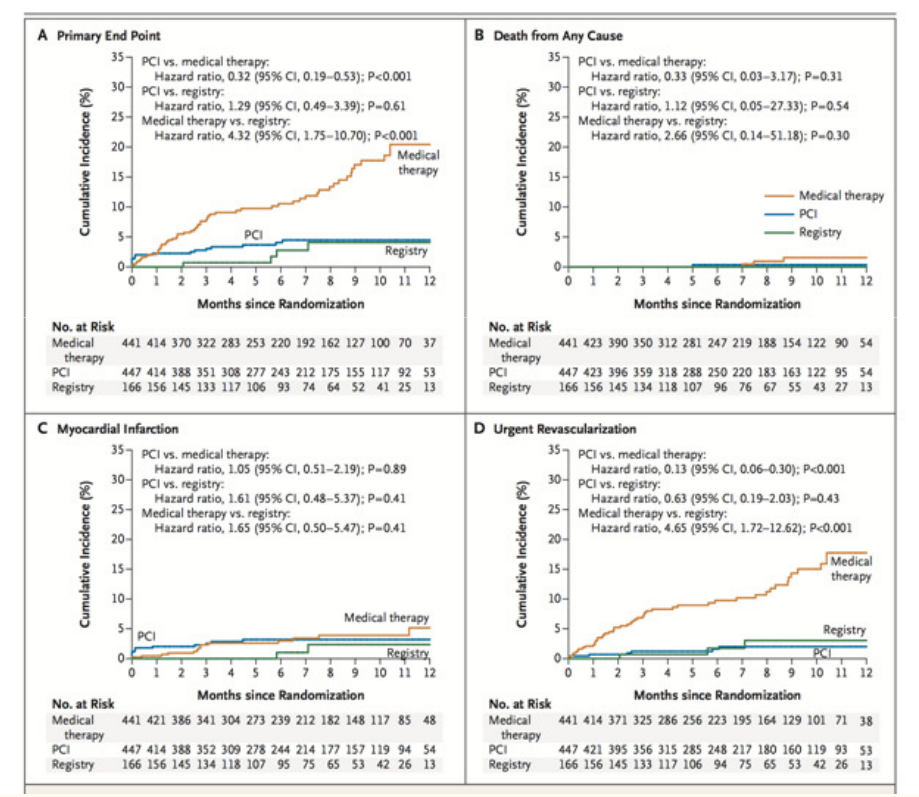
Figure 2 **Kaplan-Meier Survival Curves**

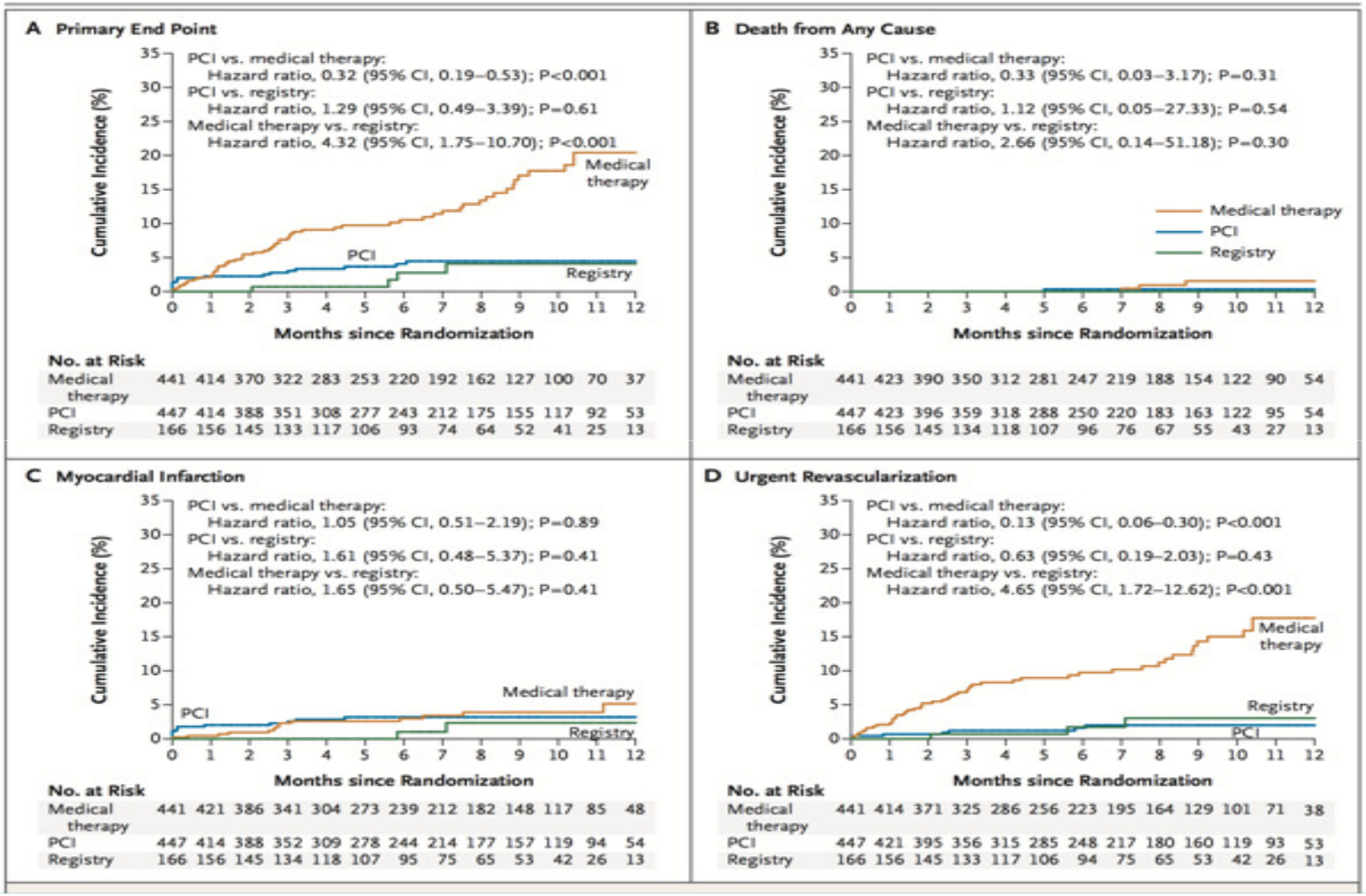
Kaplan-Meier survival curves according to study group for survival free from **(A)** major adverse cardiac event (MACE), **(B)** death, **(C)** death or myocardial infarction (MI), and **(D)** revascularization. The **red curve** indicates the angiography-guided percutaneous coronary intervention (PCI) group; the **blue curve** indicates the fractional flow reserve (FFR)-guided PCI group. CABG = coronary artery bypass graft surgery.

ESTUDO FAME 2



ESTUDO FAME 2




A Primary End Point
PCI vs. medical therapy:
Hazard ratio, 0.32 (95% CI, 0.19–0.53); P<0.001
PCI vs. registry:
Hazard ratio, 1.29 (95% CI, 0.49–3.39); P=0.61
Medical therapy vs. registry:
Hazard ratio, 4.32 (95% CI, 1.75–10.70); P<0.001
Medical therapy
PCI
Registry
Cumulative Incidence (%)
Months since Randomization
No. at Risk
Medical therapy 441 414 370 322 283 253 220 192 162 127 100 70 37
PCI 447 414 388 351 308 277 243 212 175 155 117 92 53
Registry 166 156 145 133 117 106 93 74 64 52 41 25 13
B Death from Any Cause
PCI vs. medical therapy:
Hazard ratio, 0.33 (95% CI, 0.03–3.17); P=0.31
PCI vs. registry:
Hazard ratio, 1.12 (95% CI, 0.05–27.33); P=0.54
Medical therapy vs. registry:
Hazard ratio, 2.66 (95% CI, 0.14–51.18); P=0.30
Medical therapy
PCI
Registry
Cumulative Incidence (%)
Months since Randomization
No. at Risk
Medical therapy 441 423 390 350 312 281 247 219 188 154 122 90 54
PCI 447 423 396 359 318 288 250 220 183 163 122 95 54
Registry 166 156 145 134 118 107 96 76 67 55 43 27 13
C Myocardial Infarction
PCI vs. medical therapy:
Hazard ratio, 1.05 (95% CI, 0.51–2.19); P=0.89
PCI vs. registry:
Hazard ratio, 1.61 (95% CI, 0.48–5.37); P=0.41
Medical therapy vs. registry:
Hazard ratio, 1.65 (95% CI, 0.50–5.47); P=0.41
Medical therapy
PCI
Registry
Cumulative Incidence (%)
Months since Randomization
No. at Risk
Medical therapy 441 421 386 341 304 273 239 212 182 148 117 85 48
PCI 447 414 388 352 309 278 244 214 177 157 119 94 54
Registry 166 156 145 134 118 107 95 75 65 53 42 26 13
D Urgent Revascularization
PCI vs. medical therapy:
Hazard ratio, 0.13 (95% CI, 0.06–0.30); P<0.001
PCI vs. registry:
Hazard ratio, 0.63 (95% CI, 0.19–2.03); P=0.43
Medical therapy vs. registry:
Hazard ratio, 4.65 (95% CI, 1.72–12.62); P<0.001
Medical therapy
Registry
PCI
Cumulative Incidence (%)
Months since Randomization
No. at Risk
Medical therapy 441 414 371 325 286 256 223 195 164 129 101 71 38
PCI 447 421 395 356 315 285 248 217 180 160 119 93 53
Registry 166 156 145 133 117 106 94 75 65 53 42 26 13

ESTUDO FAME 2

Table 1. Clinical Events and Triggers of Urgent Revascularization.*

Variable	PCI (N=447)	Medical Therapy (N=441)	Hazard Ratio (95% CI)†	P Value‡
	no. (%)			
Primary end point	36 (8.1)	86 (19.5)	0.39 (0.26–0.57)	<0.001
Death from any cause	6 (1.3)	8 (1.8)	0.74 (0.26–2.14)	0.58
Myocardial infarction	26 (5.8)	30 (6.8)	0.85 (0.50–1.45)	0.56
Urgent revascularization	18 (4.0)	72 (16.3)	0.23 (0.14–0.38)	<0.001
Death or myocardial infarction	29 (6.5)	36 (8.2)	0.79 (0.49–1.29)	0.35
Other end points				
Death from cardiac causes	3 (0.7)	3 (0.7)	0.99 (0.20–4.90)	0.99
Revascularization				
Any	36 (8.1)	179 (40.6)	0.16 (0.11–0.22)	<0.001
Nonurgent	18 (4.0)	117 (26.5)	0.13 (0.08–0.22)	<0.001
Stroke	7 (1.6)	4 (0.9)	1.74 (0.51–5.94)	0.37
Definite or probable stent thrombosis	7 (1.6)	2 (0.5)	3.48 (0.72–16.8)	0.10
Triggers of urgent revascularization according to Canadian Cardiovascular Society class§				
Any trigger				
All classes	18 (4.0)	72 (16.3)	0.23 (0.14–0.38)	<0.001
0, I, or II	4 (0.9)	7 (1.6)	0.56 (0.16–1.93)	0.35
III	3 (0.7)	20 (4.5)	0.14 (0.04–0.49)	<0.001
IV	11 (2.5)	47 (10.7)	0.22 (0.11–0.42)	<0.001
Myocardial infarction or changes on ECG				
All classes	15 (3.4)	31 (7.0)	0.47 (0.25–0.86)	0.01
0, I, or II	3 (0.7)	4 (0.9)	0.74 (0.17–3.31)	0.69
III	2 (0.4)	7 (1.6)	0.28 (0.06–1.35)	0.09
IV	10 (2.2)	21 (4.8)	0.46 (0.22–0.98)	0.04
Clinical features only				
All classes	3 (0.7)	43 (9.8)	0.07 (0.02–0.21)	<0.001
0, I, or II	1 (0.2)	3 (0.7)	0.33 (0.03–3.17)	0.31
III	1 (0.2)	14 (3.2)	0.07 (0.01–0.53)	0.001
IV	1 (0.2)	27 (6.1)	0.03 (0.00–0.26)	<0.001

* ECG denotes electrocardiography, and PCI percutaneous coronary intervention.
† Hazard ratios are for the PCI group as compared with the medical-therapy group.
‡ P values were calculated with the use of the log-rank test.
§ Patients could have more than one event. The Canadian Cardiovascular Society grades the severity of angina as follows: class I, angina only during strenuous or prolonged physical activity; class II, slight limitation, with angina only during vigorous physical activity; class III, symptoms with activities of everyday living (moderate limitation); and class IV, inability to perform any activity without angina or angina at rest (severe limitation).

Table 1. Clinical Events and Triggers of Urgent Revascularization.*

Variable	PCI (N = 447)	Medical Therapy (N = 441)	Hazard Ratio (95% CI)†	P Value‡
	no. (%)			
Primary end point	36 (8.1)	86 (19.5)	0.39 (0.26–0.57)	<0.001
Death from any cause	6 (1.3)	8 (1.8)	0.74 (0.26–2.14)	0.58
Myocardial infarction	26 (5.8)	30 (6.8)	0.85 (0.50–1.45)	0.56
Urgent revascularization	18 (4.0)	72 (16.3)	0.23 (0.14–0.38)	<0.001
Death or myocardial infarction	29 (6.5)	36 (8.2)	0.79 (0.49–1.29)	0.35
Other end points				
Death from cardiac causes	3 (0.7)	3 (0.7)	0.99 (0.20–4.90)	0.99
Revascularization				
Any	36 (8.1)	179 (40.6)	0.16 (0.11–0.22)	<0.001
Nonurgent	18 (4.0)	117 (26.5)	0.13 (0.08–0.22)	<0.001
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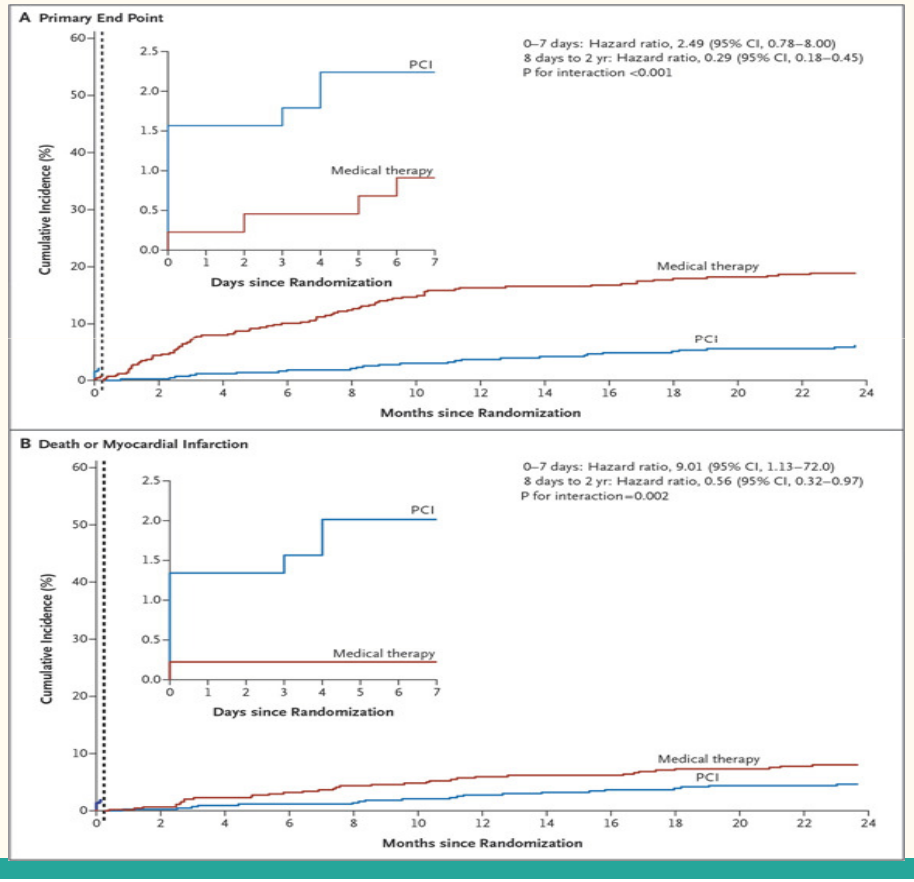
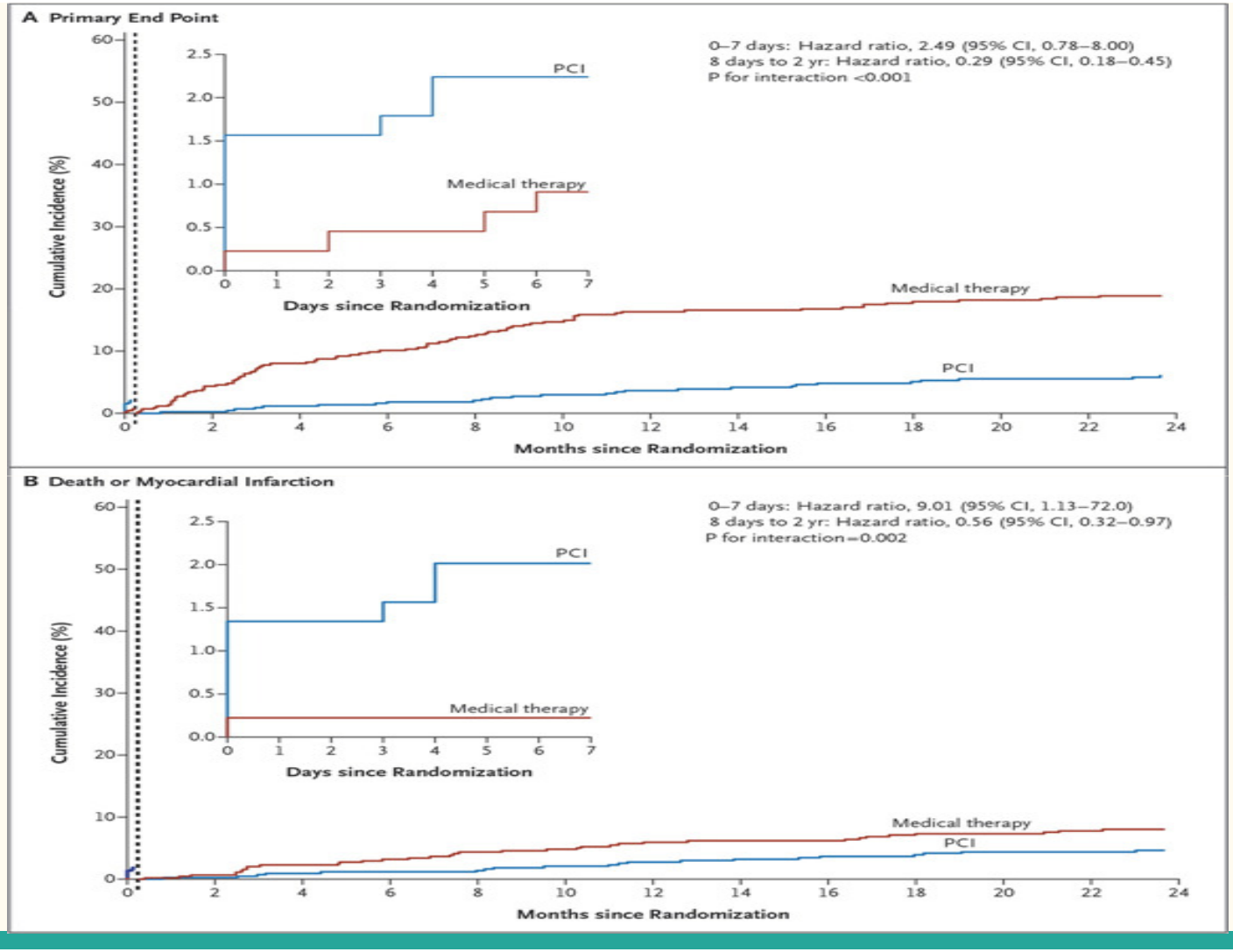
All classes	18 (4.0)	72 (16.3)	0.23 (0.14–0.38)	<0.001
0, I, or II	4 (0.9)	7 (1.6)	0.56 (0.16–1.93)	0.35
III	3 (0.7)	20 (4.5)	0.14 (0.04–0.49)	<0.001
IV	11 (2.5)	47 (10.7)	0.22 (0.11–0.42)	<0.001
Myocardial infarction or changes on ECG				
All classes	15 (3.4)	31 (7.0)	0.47 (0.25–0.86)	0.01
0, I, or II	3 (0.7)	4 (0.9)	0.74 (0.17–3.31)	0.69
III	2 (0.4)	7 (1.6)	0.28 (0.06–1.35)	0.09
IV	10 (2.2)	21 (4.8)	0.46 (0.22–0.98)	0.04
Clinical features only				
All classes	3 (0.7)	43 (9.8)	0.07 (0.02–0.21)	<0.001
0, I, or II	1 (0.2)	3 (0.7)	0.33 (0.03–3.17)	0.31
III	1 (0.2)	14 (3.2)	0.07 (0.01–0.53)	0.001
IV	1 (0.2)	27 (6.1)	0.03 (0.00–0.26)	<0.001

* ECG denotes electrocardiography, and PCI percutaneous coronary intervention.
† Hazard ratios are for the PCI group as compared with the medical-therapy group.
‡ P values were calculated with the use of the log-rank test.
§ Patients could have more than one event. The Canadian Cardiovascular Society grades the severity of angina as follows: class I, angina only during strenuous or prolonged physical activity; class II, slight limitation, with angina only during vigorous physical activity; class III, symptoms with activities of everyday living (moderate limitation); and class IV, inability to perform any activity without angina or angina at rest (severe limitation).

ESTUDO FAME 2




A Primary End Point
0–7 days: Hazard ratio, 2.49 (95% CI, 0.78–8.00)
8 days to 2 yr: Hazard ratio, 0.29 (95% CI, 0.18–0.45)
P for interaction <0.001
PCI
Medical therapy
Cumulative Incidence (%)
Days since Randomization
Medical therapy
PCI
Months since Randomization
B Death or Myocardial Infarction
0–7 days: Hazard ratio, 9.01 (95% CI, 1.13–72.0)
8 days to 2 yr: Hazard ratio, 0.56 (95% CI, 0.32–0.97)
P for interaction=0.002
PCI
Medical therapy
Cumulative Incidence (%)
Days since Randomization
Medical therapy
PCI
Months since Randomization

FAME 3

- PROSPECTIVO, RANDOMIZADO;
- POPULAÇÃO: TRIARTERIAIS SEM ENVOLVIMENTO DE TCE
- COMPARARÁ ICP GUIADA POR FFR VERSUS CIRURGIA DE RM;
- DESFECHO PRIMÁRIO: ÓBITO, INFARTO, AVC, QQ. REVASC APÓS 1A;
- PREVISTA INCLUSÃO DE 1500 PACIENTES
- AGOSTO DE 2017 É A DATA DE CONCLUSÃO PRIMÁRIA

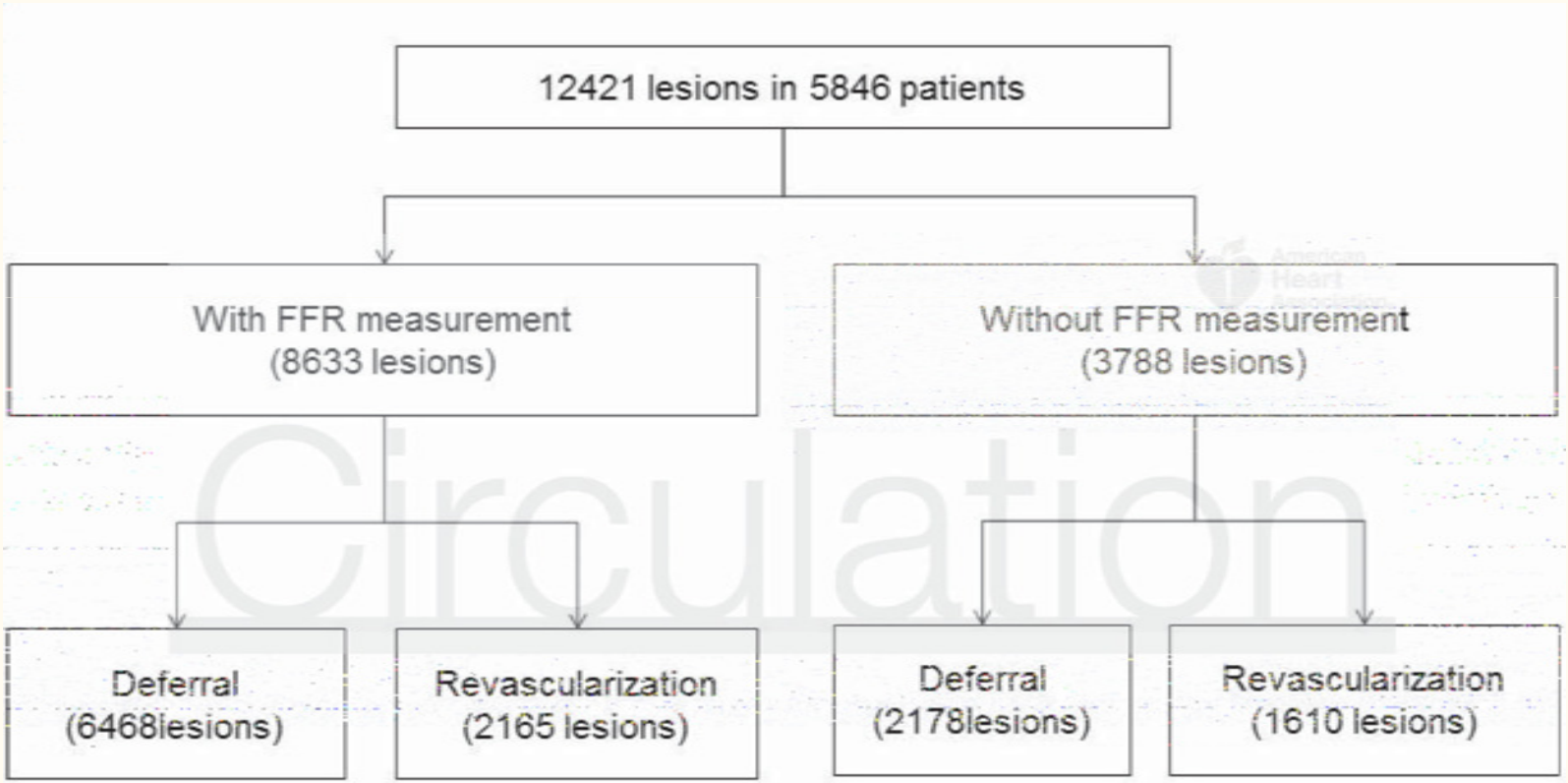
ESTUDO FUTURE

- RESULTADOS "PREOCUPANTES" APRESENTADOS EM NOV/2014 NO ACC
- COMPARARIA ESTRATÉGIA GUIADA POR FFR VERSUS PCI EM PACIENTES COMPLEXOS, DE ALTO RISCO (MULTIARTERIAIS E/OU ENVOLVIMENTO DO TRONCO)
- INCLUIRIA 1728 PACIENTES
- INTERROMPIDO APÓS A INCLUSÃO DE 933 PACIENTES POR UM EXCESSO DE MORTALIDADE (QUE POSTERIORMENTE SE PROVOU SER NÃO SIGNIFICATIVO) NO GRUPO F.F.R. SEM BENEFÍCIO CLÍNICO
- APESAR DESSES ACHADOS O "FUTURO" DA F.F.R. AINDA É PROMISSOR

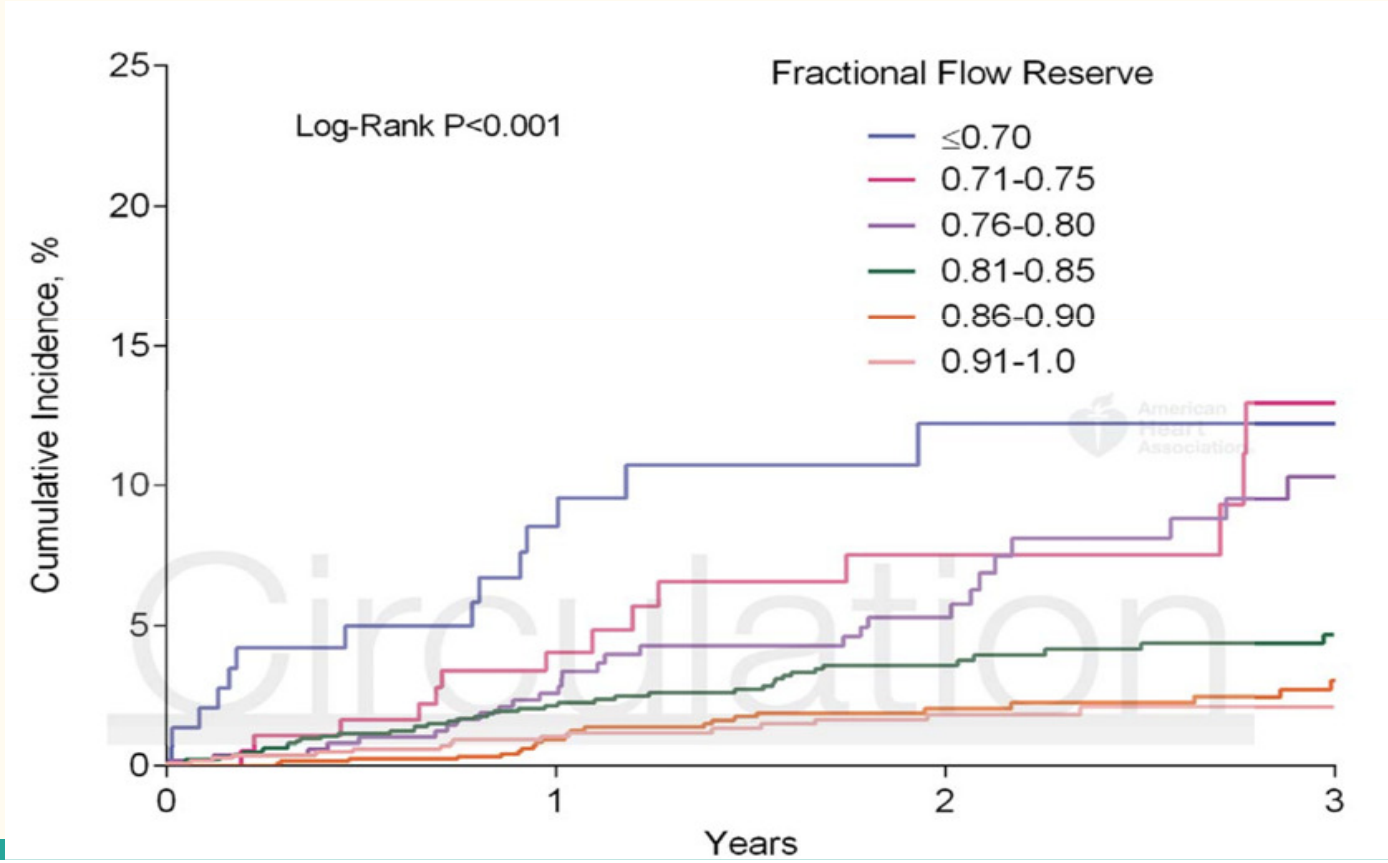
ESTUDO IRIS

- ESTUDO SUL-COREANO (30 CENTROS), INCLUIU TODAS OS PACIENTES SUBMETIDOS A F.F.R. DE PELO MENOS 1 LESÃO
- REGISTRO PROSPECTIVO DE 5846 PACIENTES COM 12.421 LESÕES (MAIOR REGISTRO PROSPECTIVO ATÉ O MOMENTO), 8633 F.F.R. REALIZADOS;
- AVALIOU O FFR COMO VARIÁVEL DISCRETA E CONTÍNUA
- CORROBORA PARA DEMONSTRAR O VALOR PROGNÓSTICO DO F.F.R. COMO PREDITOR INDEPENDENTE DE EVENTOS
- PARA LESÕES COM F.F.R. $\leq$ 0,75 A REVASCULARIZAÇÃO FOI MELHOR; SE F.F.R. $>$ 0,75, NÃO MOSTROU BENEFÍCIO DA REVASC.

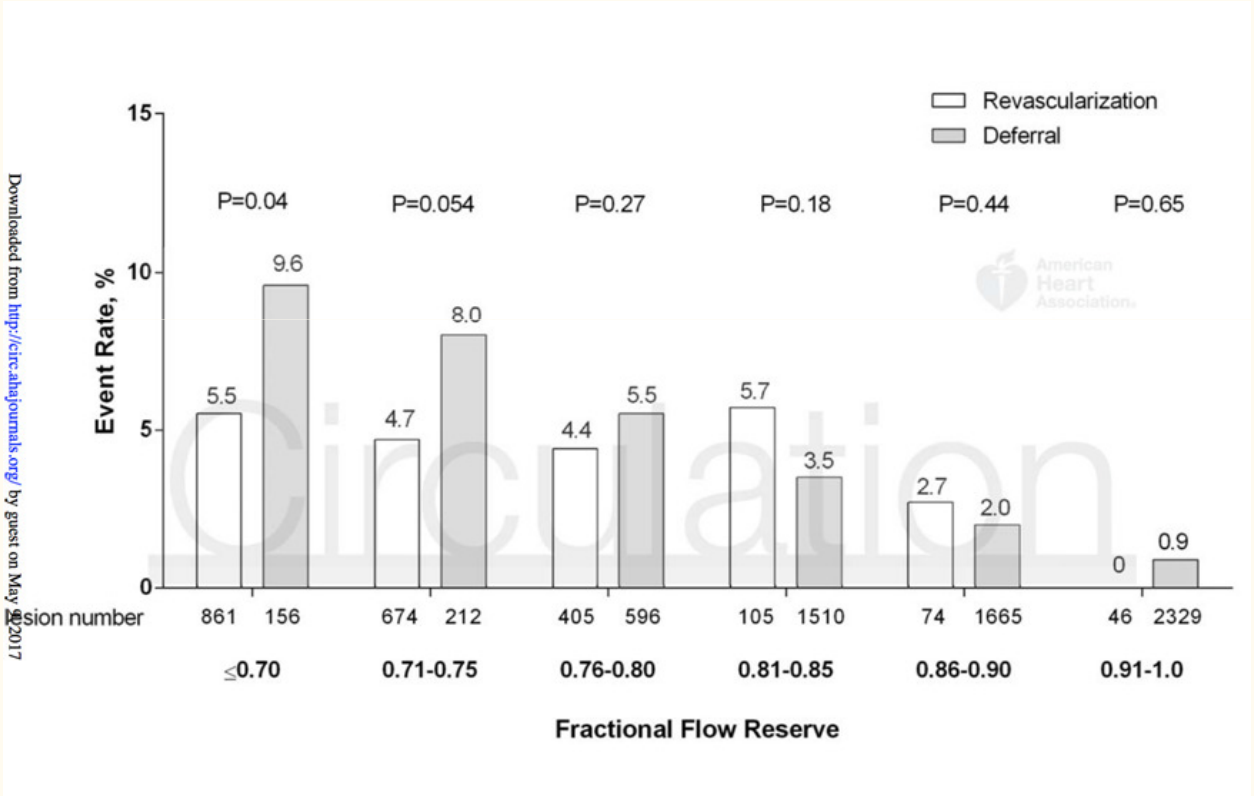
ESTUDO IRIS


12421 lesions in 5846 patients
With FFR measurement
(8633 lesions)
Without FFR measurement
(3788 lesions)
Deferral
(6468lesions)
Revascularization
(2165 lesions)
Deferral
(2178lesions)
Revascularization
(1610 lesions)

ESTUDO IRIS


Fractional Flow Reserve
Log-Rank P<0.001
≤0.70
0.71-0.75
0.76-0.80
0.81-0.85
0.86-0.90
0.91-1.0
Cumulative Incidence, %
25
20
15
10
5
0
0
1
2
3
Years
Circulation

ESTUDO IRIS



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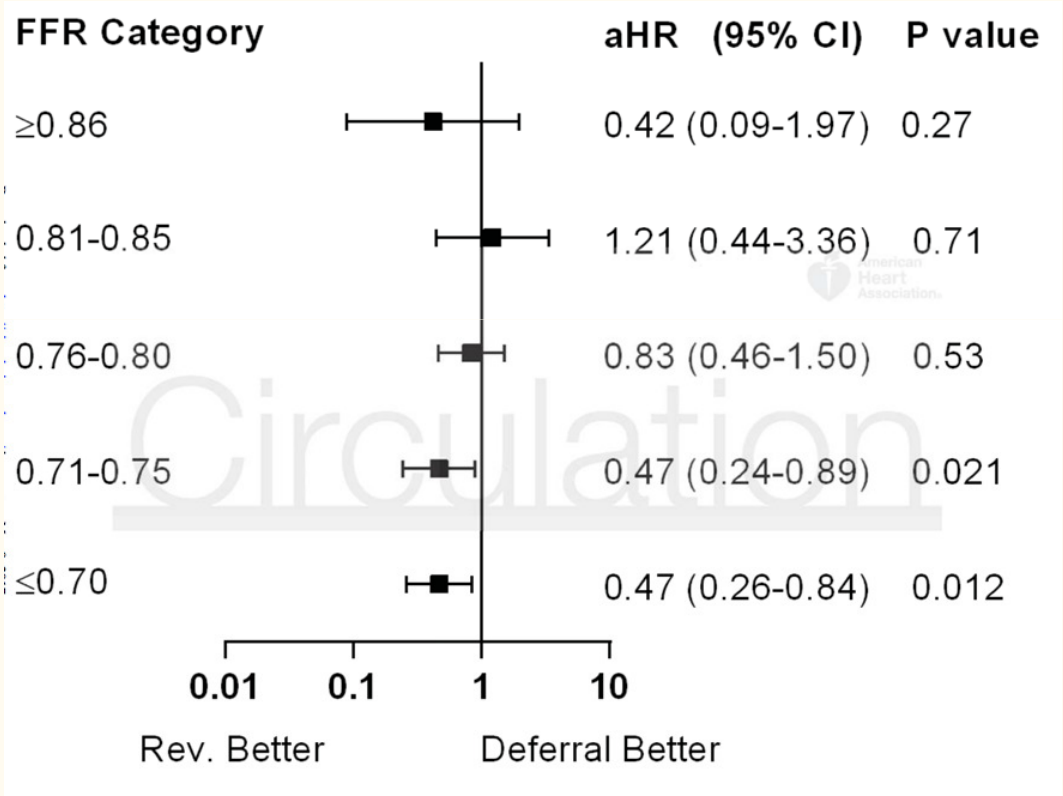
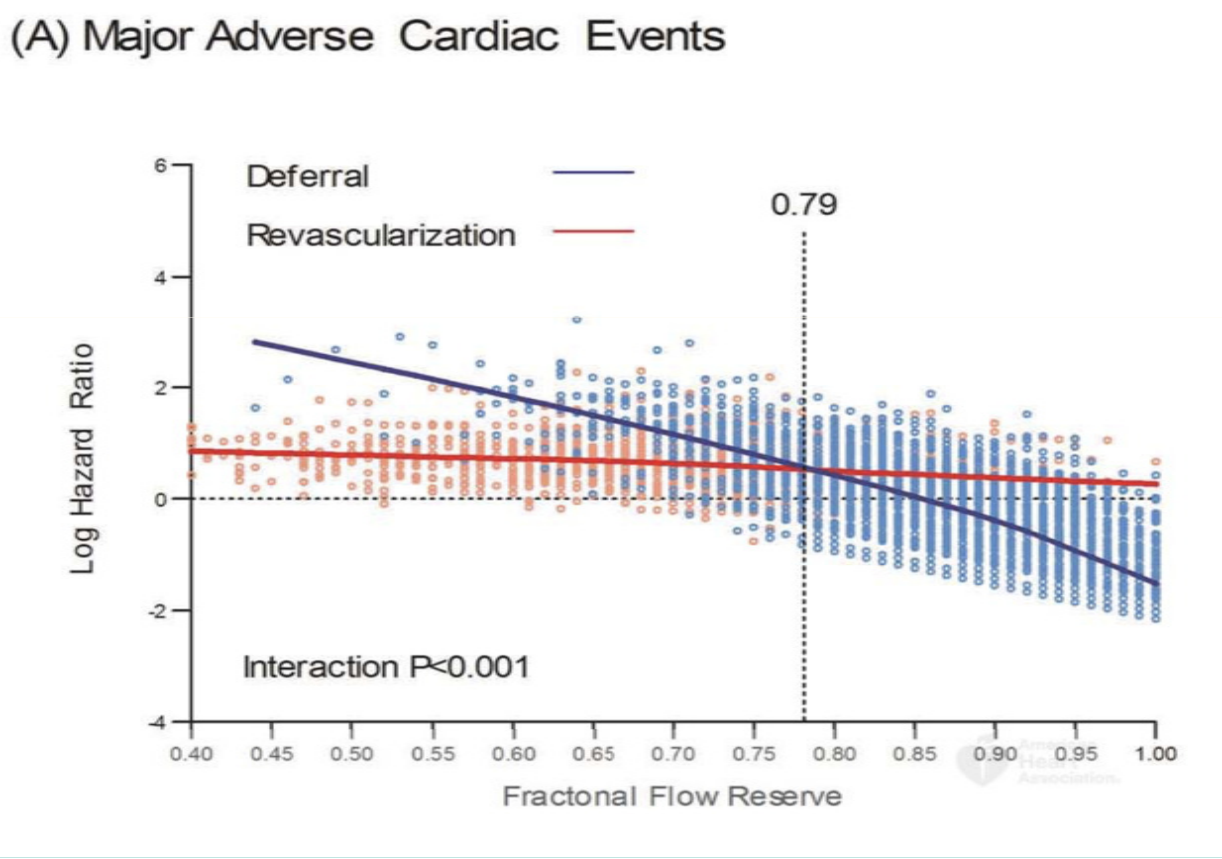

FFR Category
aHR (95% CI)
P value
≥0.86
0.42 (0.09-1.97)
0.27
0.81-0.85
1.21 (0.44-3.36)
0.71
0.76-0.80
0.83 (0.46-1.50)
0.53
0.71-0.75
0.47 (0.24-0.89)
0.021
≤0.70
0.47 (0.26-0.84)
0.012
0.01
0.1
1
10
Rev. Better
Deferral Better

ESTUDO IRIS


(A) Major Adverse Cardiac Events
Deferral
Revascularization
0.79
Log Hazard Ratio
6
4
2
0
-2
-4
Interaction P<0.001
0.40
0.45
0.50
0.55
0.60
0.65
0.70
0.75
0.80
0.85
0.90
0.95
1.00
Fractonal Flow Reserve

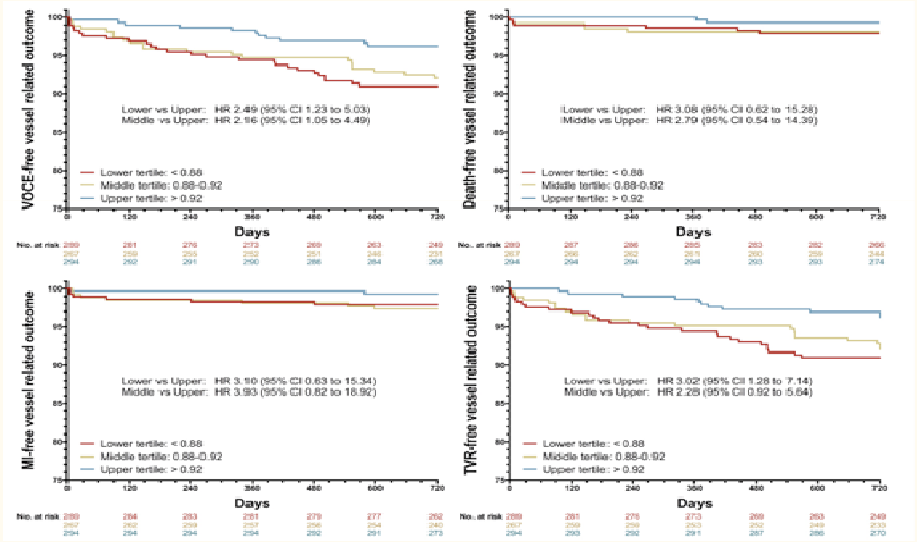
ESTUDO IRIS

Table 3. Adjusted Risk of Major Adverse Cardiac Events in Deferred Lesions According to the Fractional Flow Reserve

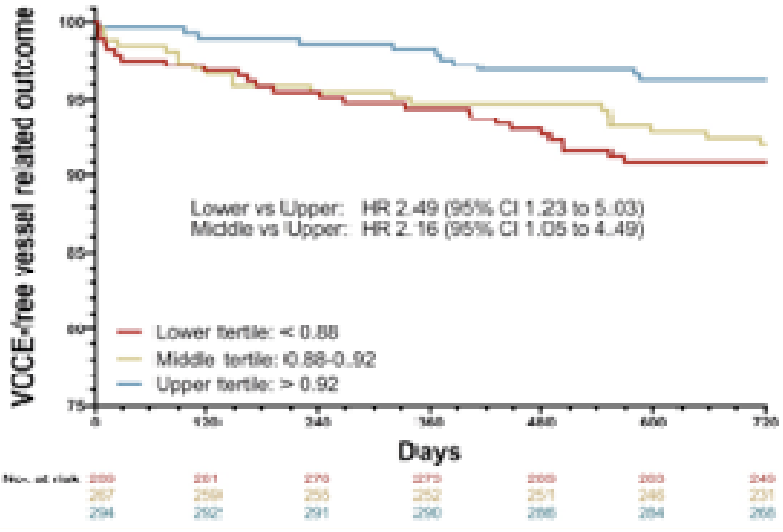
	Event Number (Incidence Rate)*	FFR as categorical variable						P for trend	FFR as continuous variable	P-value
		≤0.70 (N=156)	0.71-0.75 (N=212)	0.76-0.80 (N=596)	0.81-0.85 (N=1510)	0.86-0.90 (N=1665)	0.91-1.00 (N=2329)			
MACE†	173 (1.44)	6.66‡ (3.28-13.5)	5.04 (2.58 – 9.82)	3.99 (2.26 – 7.05)	2.48 (1.47 – 4.20)	1.60 (0.91 – 2.80)	1 reference	< 0.001	1.06 (1.05 – 1.08)	< 0.001
Cardiac death	11 (0.09)	3.03 (0.16 – 56.8)	5.18 (0.84 – 31.9)	2.26 (0.37 – 13.8)	0.44 (0.04 – 4.35)	0.81 (0.13 – 5.11)	1 reference	0.19	1.06 (0.99 – 1.13)	0.12
MI	17 (0.14)	12.0 (0.99 – 144.1)	22.1 (3.39 – 143.8)	8.87 (1.56 – 49.4)	3.43 (0.75 – 15.7)	0.85 (0.13 – 5.42)	1 reference	< 0.001	1.09 (1.05 – 1.14)	<0.001
Cardiac death or MI	26 (0.21)	5.00 (0.79 – 31.7)	9.34 (2.40 – 36.5)	3.48 (0.87 – 13.85)	1.78 (0.48 – 6.55)	1.03 (0.26 – 4.00)	1 reference	< 0.001	1.07 (1.04 – 1.11)	< 0.001
Repeat revascularization	161 (1.34)	10.4 (4.52 – 24.1)	7.73 (3.51 – 17.0)	5.73 (2.90 – 11.3)	3.49 (1.88 – 6.49)	2.07 (1.09 – 3.91)	1 reference	< 0.001	1.07 (1.06 – 1.09)	< 0.001

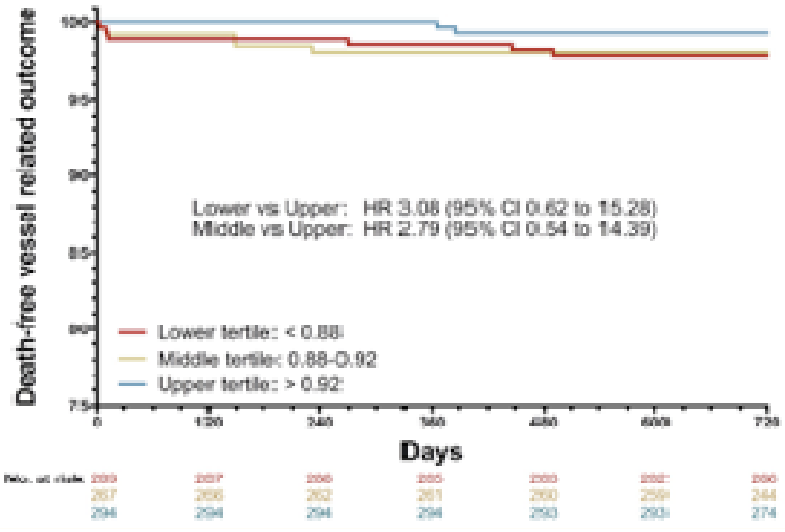
*100 lesion-year. †MACE indicates the major adverse cardiac event (the composite of cardiac death, myocardial infarction, and repeat revascularization); MI, myocardial infarction. ‡Hazard ratio (95% confidence interval)

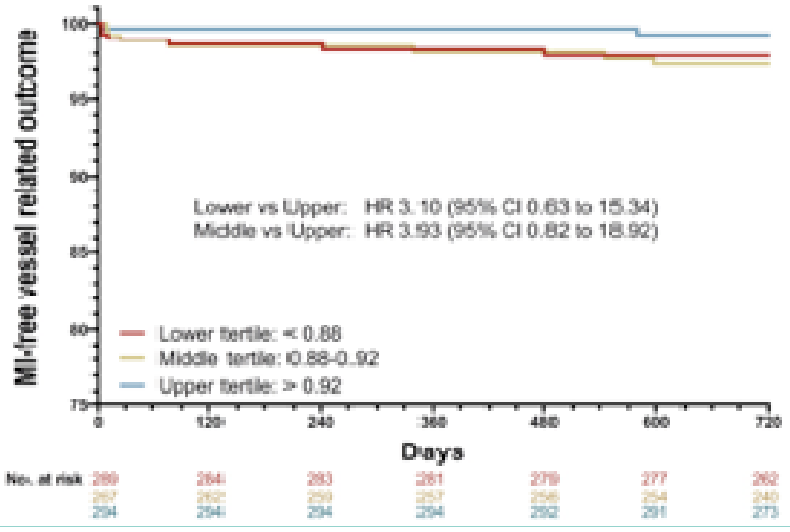
F.F.R. PÓS-IMPLANTE: ANÁLISE FAME E FAME 2

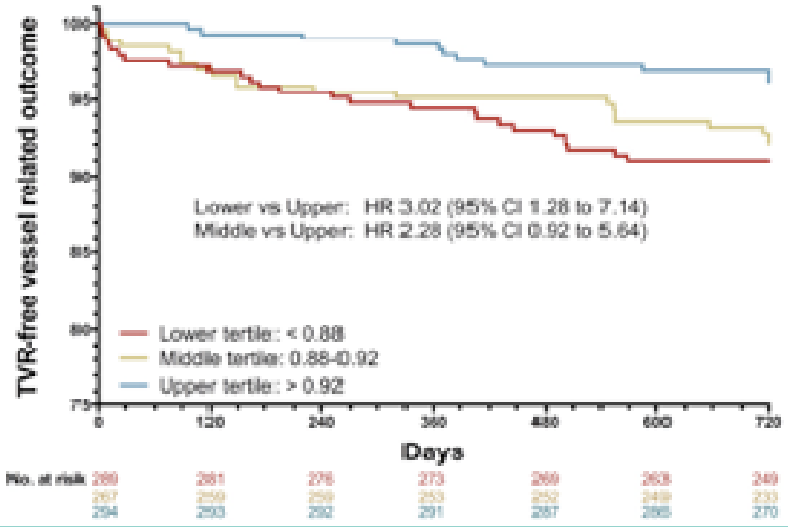


REF.: ZSOLT PIROTH. PREDICTIVE VALUE OF FRACTIONAL FLOW RESERV AFTER DRUG-ELUTING STENT IMPLANTATION. APRESENTAÇÃO ORAL DO AUTOR, TCT 2016


VCCE-free vessel related outcome
Lower vs Upper: HR 2.49 (95% CI 1.23 to 5.03)
Middle vs Upper: HR 2.16 (95% CI 1.05 to 4.49)
Lower tertile: < 0.88
Middle tertile: 0.88-0.92
Upper tertile: > 0.92
Days


Death-free vessel related outcome
Lower vs Upper: HR 3.08 (95% CI 0.62 to 15.28)
Middle vs Upper: HR 2.79 (95% CI 0.54 to 14.39)
Lower tertile: < 0.88
Middle tertile: 0.88-0.92
Upper tertile: > 0.92
Days


MI-free vessel related outcome
Lower vs Upper: HR 3.10 (95% CI 0.63 to 15.34)
Middle vs Upper: HR 3.93 (95% CI 0.82 to 18.92)
Lower tertile: < 0.88
Middle tertile: 0.88-0.92
Upper tertile: > 0.92
Days


TVR-free vessel related outcome
Lower vs Upper: HR 3.02 (95% CI 1.28 to 7.14)
Middle vs Upper: HR 2.28 (95% CI 0.92 to 5.64)
Lower tertile: < 0.88
Middle tertile: 0.88-0.92
Upper tertile: > 0.92
Days

F.F.R. VERSUS R.M.P.: ESTUDO MR-INFORM

- ESTUDO REALIZADO EM LONDRES, INGLATERRA
- INCLUIU 918 PACIENTES COM ANGINA ESTÁVEL
- PROSPECTIVO, RANDOMIZADO 1:1 (CATE+F.F.R. VERSUS R.M.P.)
- GRUPO F.F.R.: CATE+F.F.R. DE TODAS AS LESÕES 40-95%;
- GRUPO R.M.P.: R.M.P. APENAS, CATE COM INTENÇÃO DE REVASC. SE DEFEITO DE PERFUSÃO DE 2 OU MAIS CORTES OU SEGMENTOS ADJACENTES;
- DIMENSIONADO PARA NÃO-INFERIORIDADE DA R.M.P.;
- DESFECHO PRIMÁRIO: MACE EM 1 ANO.

MR-INFORM - RESULTADOS:

	FFR (N=464)	R.M.P. (N=454)	p
MACE	3,9%	3,3%	0,62
ÓBITO	0,22% (1)	0,89% (4)	
IAM	1,7%	1,8%	
REVASC REPETIDA	1,9%	0,7%	
CATE SEM LESÕES OBSTRUTIVAS	35,6%	8,1%*	
REVASC DURANTE EVENTO ÍNDICE	44,2%	36,0%	0,0053

* APENAS 49,6% DOS PACIENTES NO GRUPO R.M.P. FIZERAM CATE

REF.: APRESENTAÇÃO DO AUTOR (NAGEL AC) NO ACC 2017 EM 17/03/2017

CONCLUSÕES

- F.F.R. É SEGURO E VIÁVEL COMO ESTRATÉGIA PARA ORIENTAR O TRATAMENTO DE LESÕES DE DIFÍCIL INTERPRETAÇÃO ANGIOGRÁFICA;
- O SEU USO PRÉ-PROCEDIMENTO E PÓS-PROCEDIMENTO TRAZ INFORMAÇÕES PROGNÓSTICAS DE FORMA INEQUÍVOCA;
- O SEU USO PARA GUIAR O TRATAMENTO NÃO PARECE ALTERAR MORTALIDADE ATÉ O MOMENTO (MAS A REVASC. BEM INDICADA REDUZ EVENTOS);
- UM BOM RESULTADO PÓS IMPLANTE PRENUNCIA BONS RESULTADOS MAS NÃO É O MELHOR MÉTODO PARA AVALIAR IMPLANTES;
- NÃO ESTÁ CLARO SE ACRESCENTA INFORMAÇÕES SE COMPARADO COM MÉTODOS NÃO-INVASIVOS.

OBRIGADO!