GUIA DE PRESIONES Y FFR

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SOCIME

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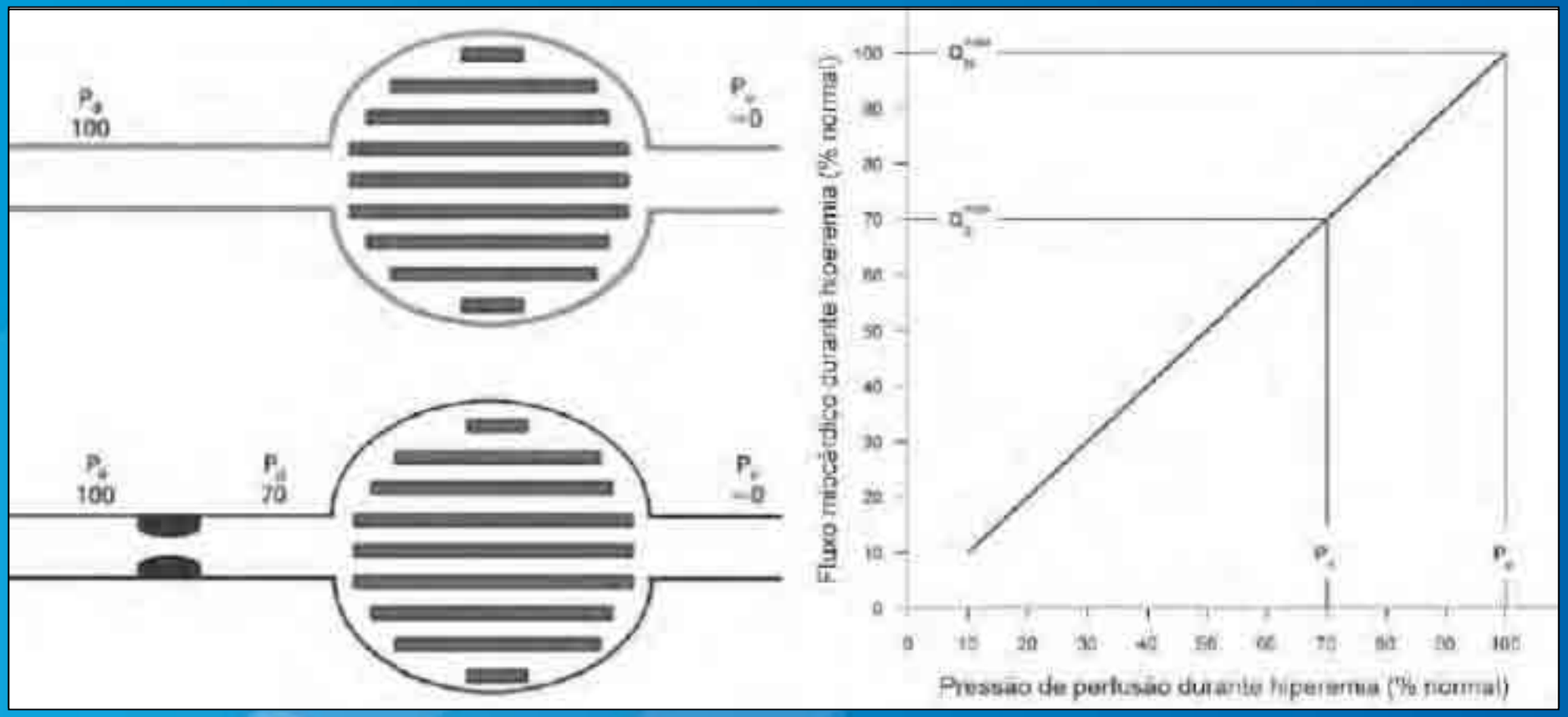
Flujo Fraccionado de Reserva Miocárdica (FFR)

Flujo sanguíneo máximo para el miocárdio en la presencia de uma estenosis, dividido por ese mismo flujo si no huviese ninguna estenosis.

Ese índice representa la fracción del flujo miocárdico máximo normal que podrá ser alcanzado limitado por la presencia de estenosis.

El FFR puede ser facilmente determinado dividiendose la presión média distal a la lesión coronária por la presión média en aorta durante la vasodilatación maxima (induzida por papaverina o adenosina IC o adenosina EV).

Flujo Fraccionado de Reserva Miocárdica (FFR)

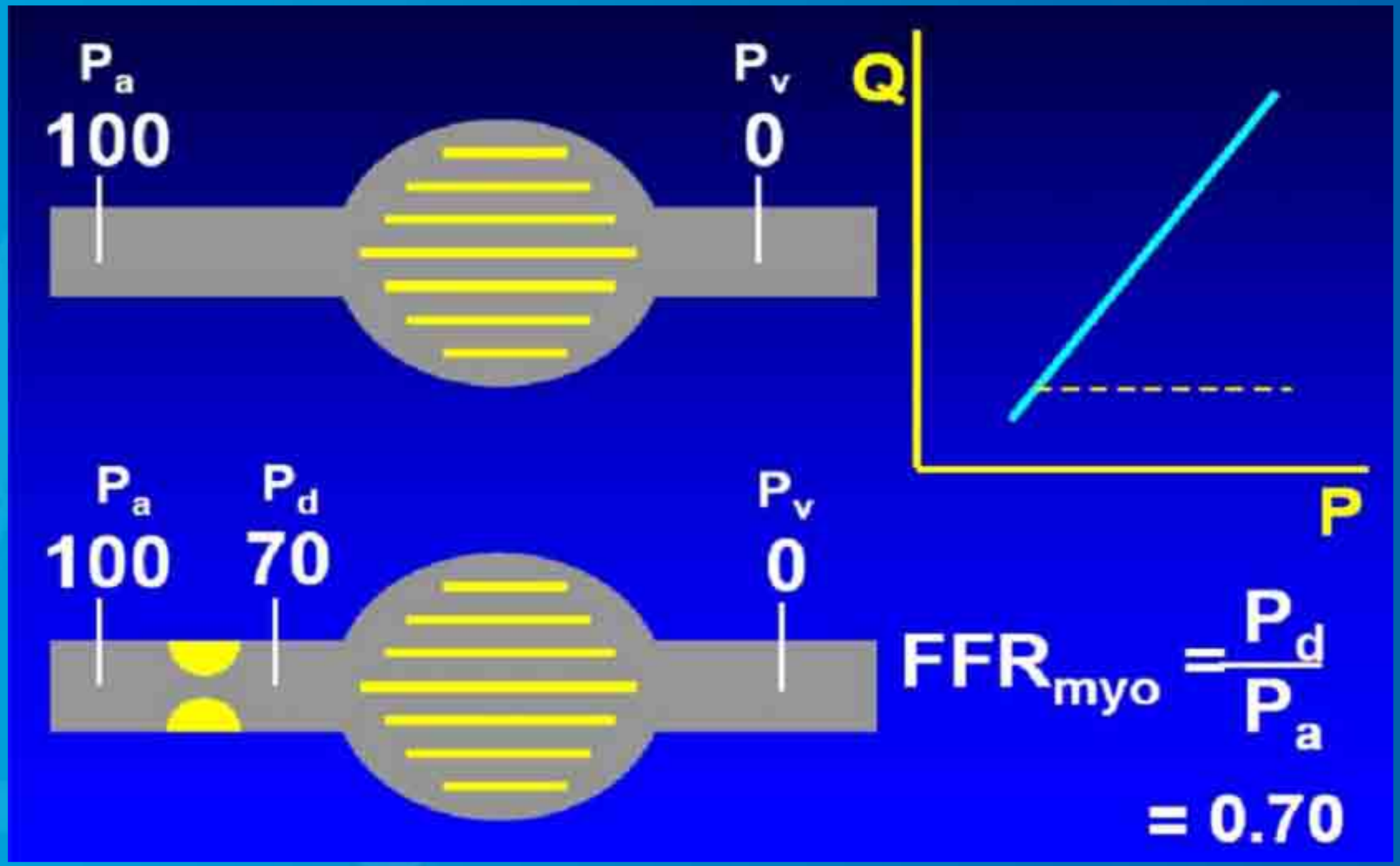


Sin estenosis: **la pressión de perfusión (Pa) determina el flujo máximo (100%) normal de miocárdio (Pa = Pd).**

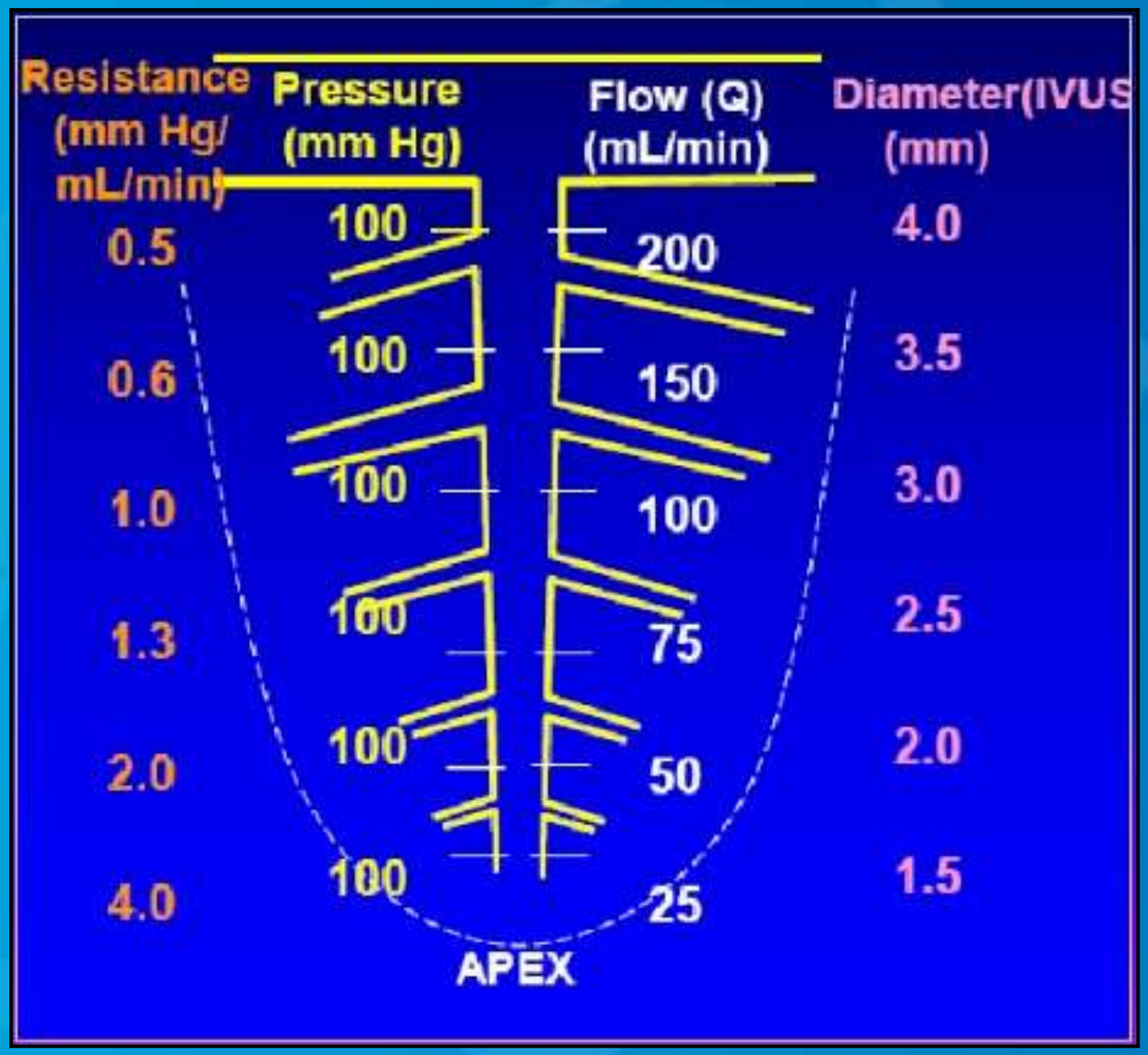
Con estenosis: **con gradiente de 30mmHg durante hiperemia máxima, la presión de perfusión distal (Pd) caerá para 70mmHg.**

Relación entre flujo y presión en el miocárdio es linear durante la hiperemia, el flujo miocárdico alcanzará apenas 70% de su valor normal

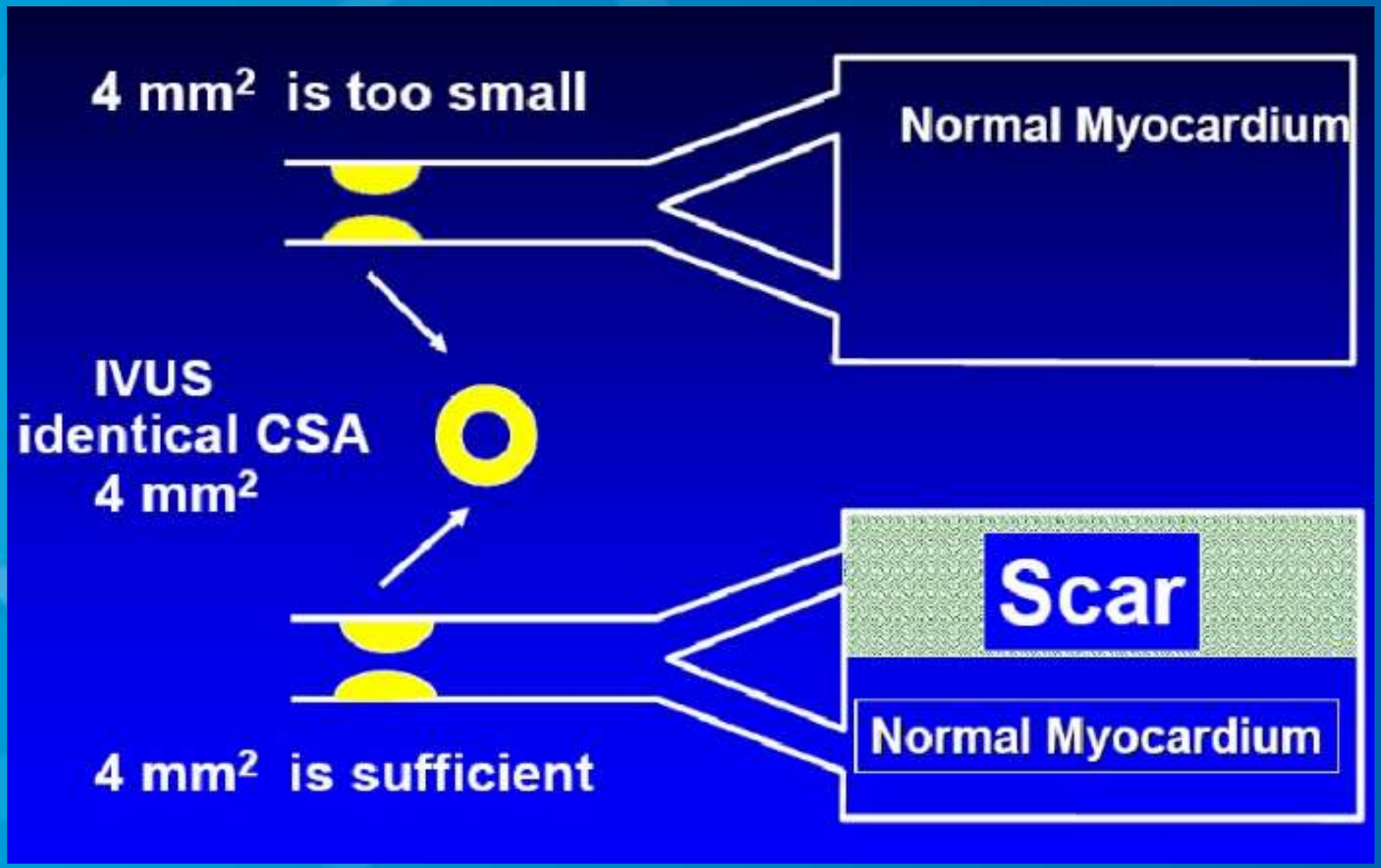
FFR durante vasodilatación máxima



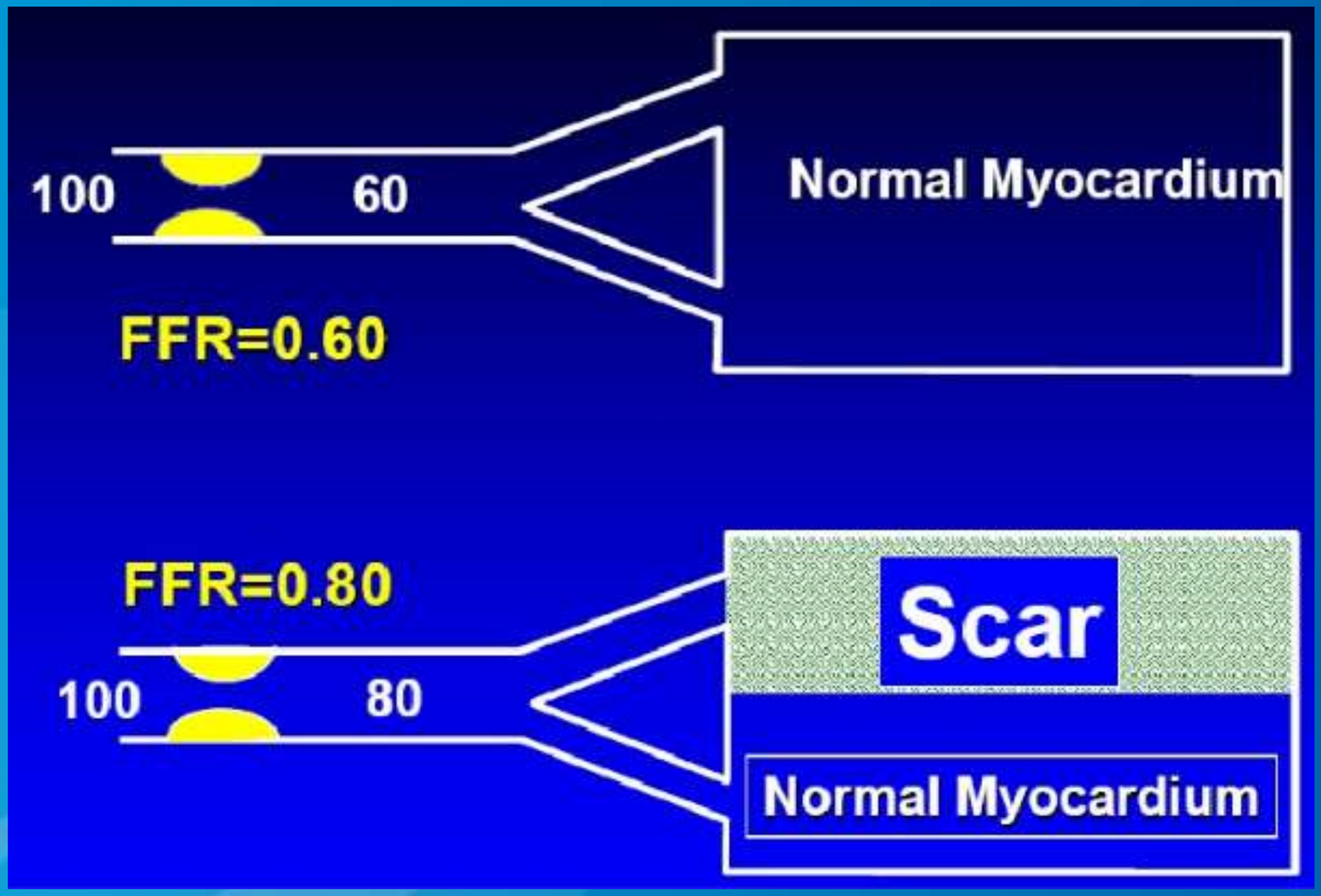
Presión, Flujo, Resistencia y tamaño del vaso



FFR: estenosis similares com diferente área de perfusión

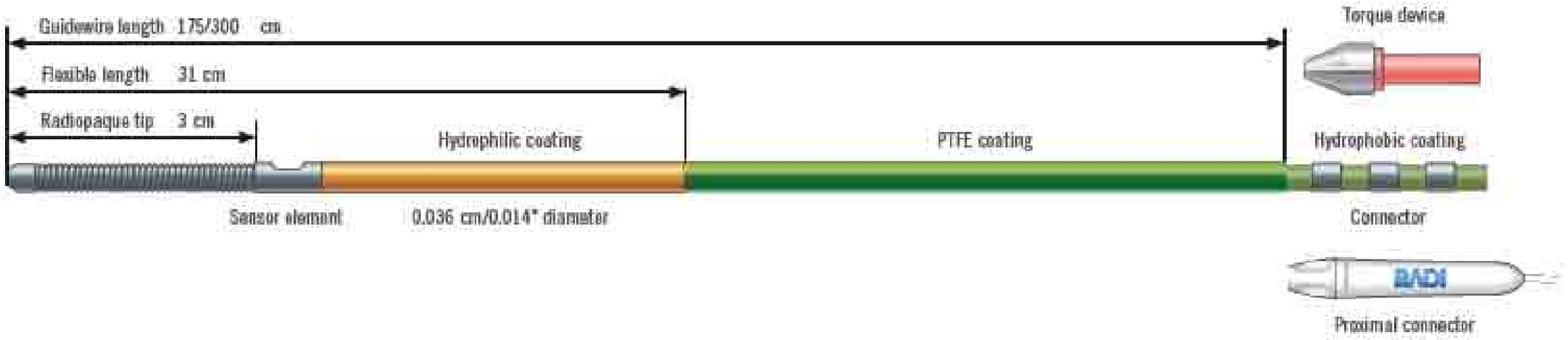


FFR y grado del área de perfusión



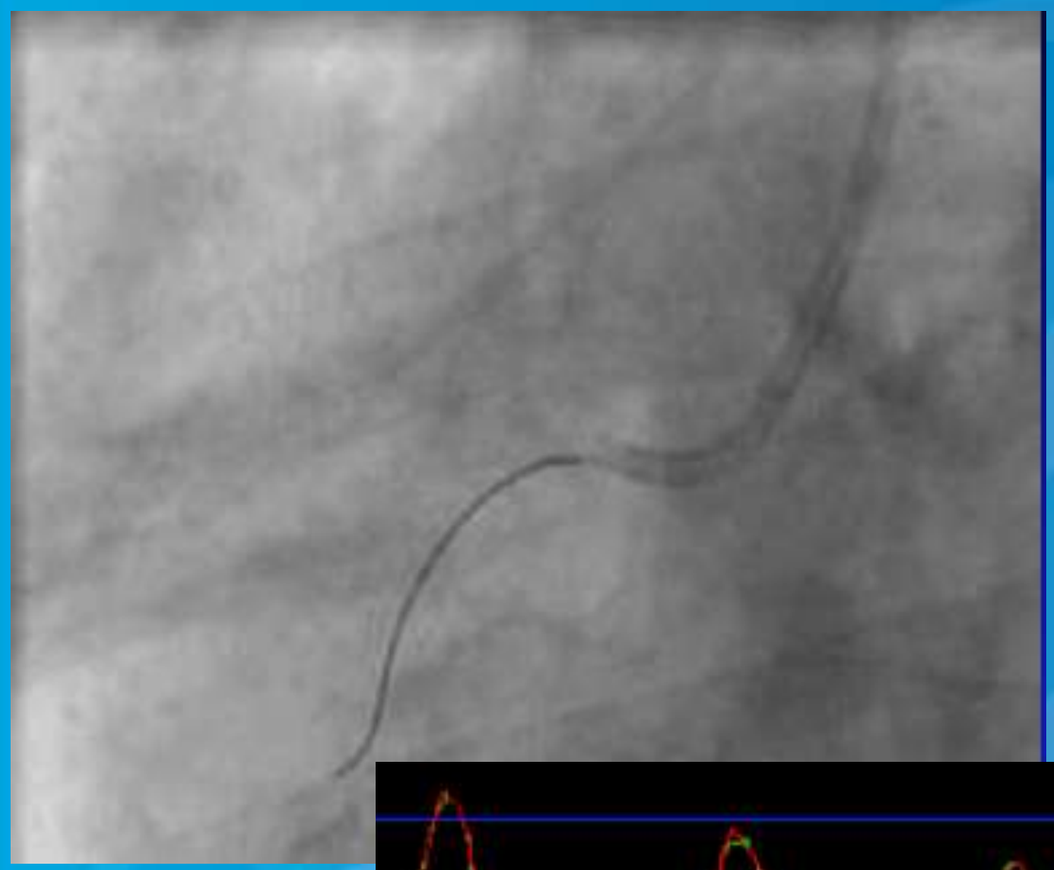
Ademas de las caracteristicas morfológicas da las estenosis es importante el territotio de perfusiónLa severidad anatómica de la estenosis por IVUS o QCA es idéntica pero la severidad fisiológica se há disminuido.
FFR explica estos cambios !

FFR



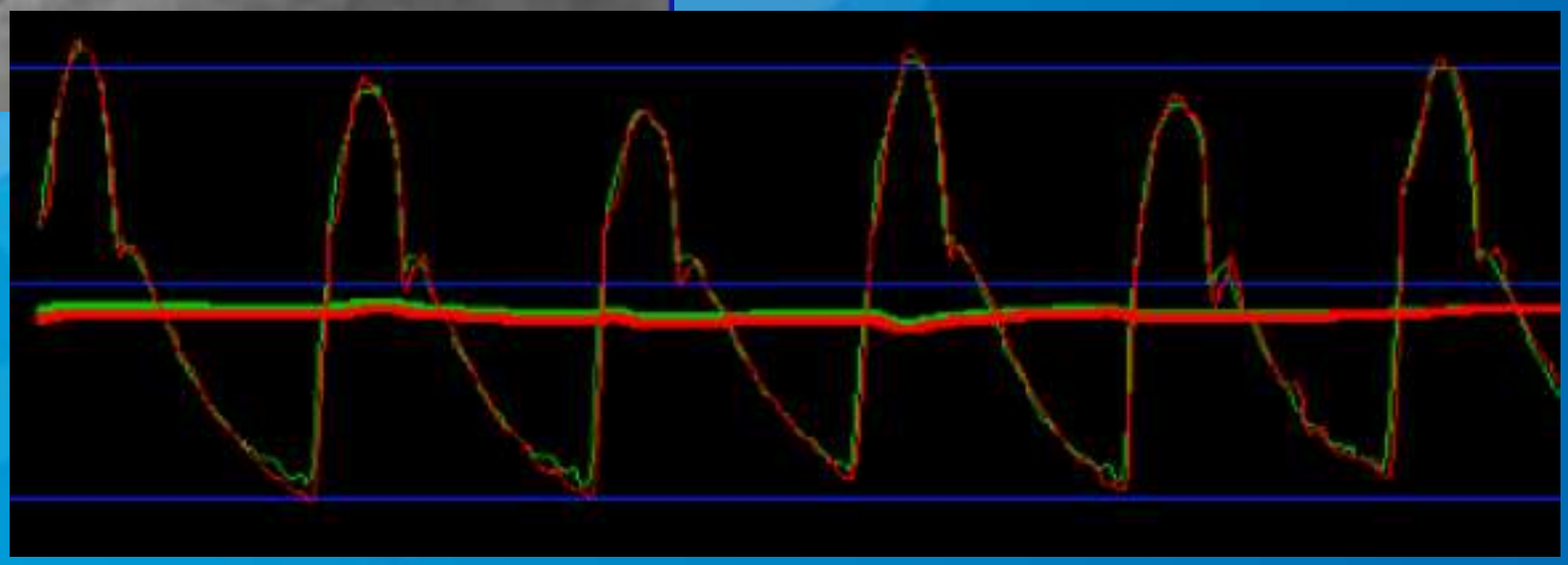
ST. JUDE MEDICAL
MORE CONTROL. LESS RISK.

FFR: técnica

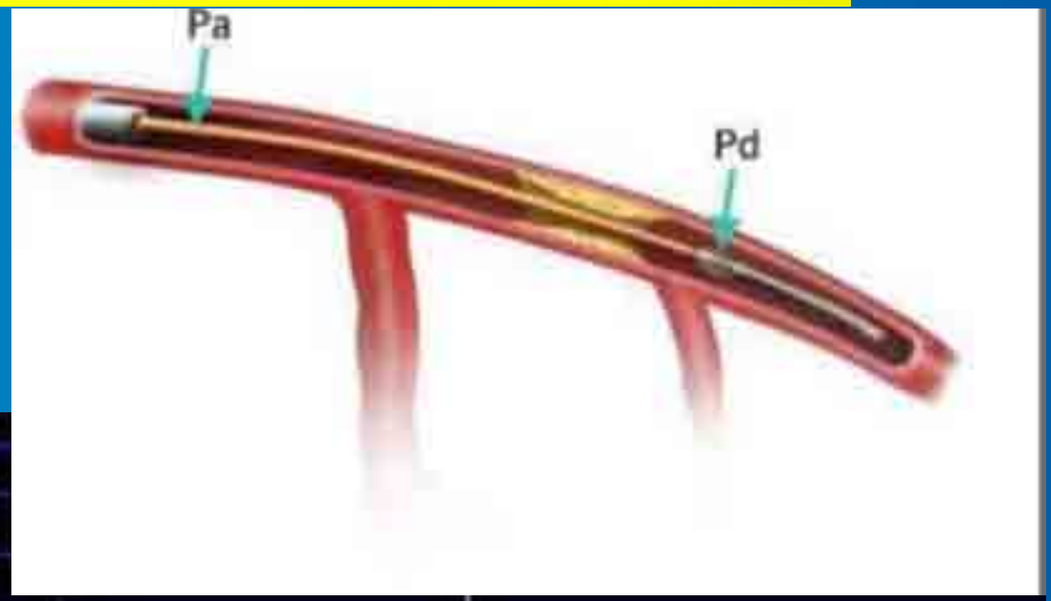


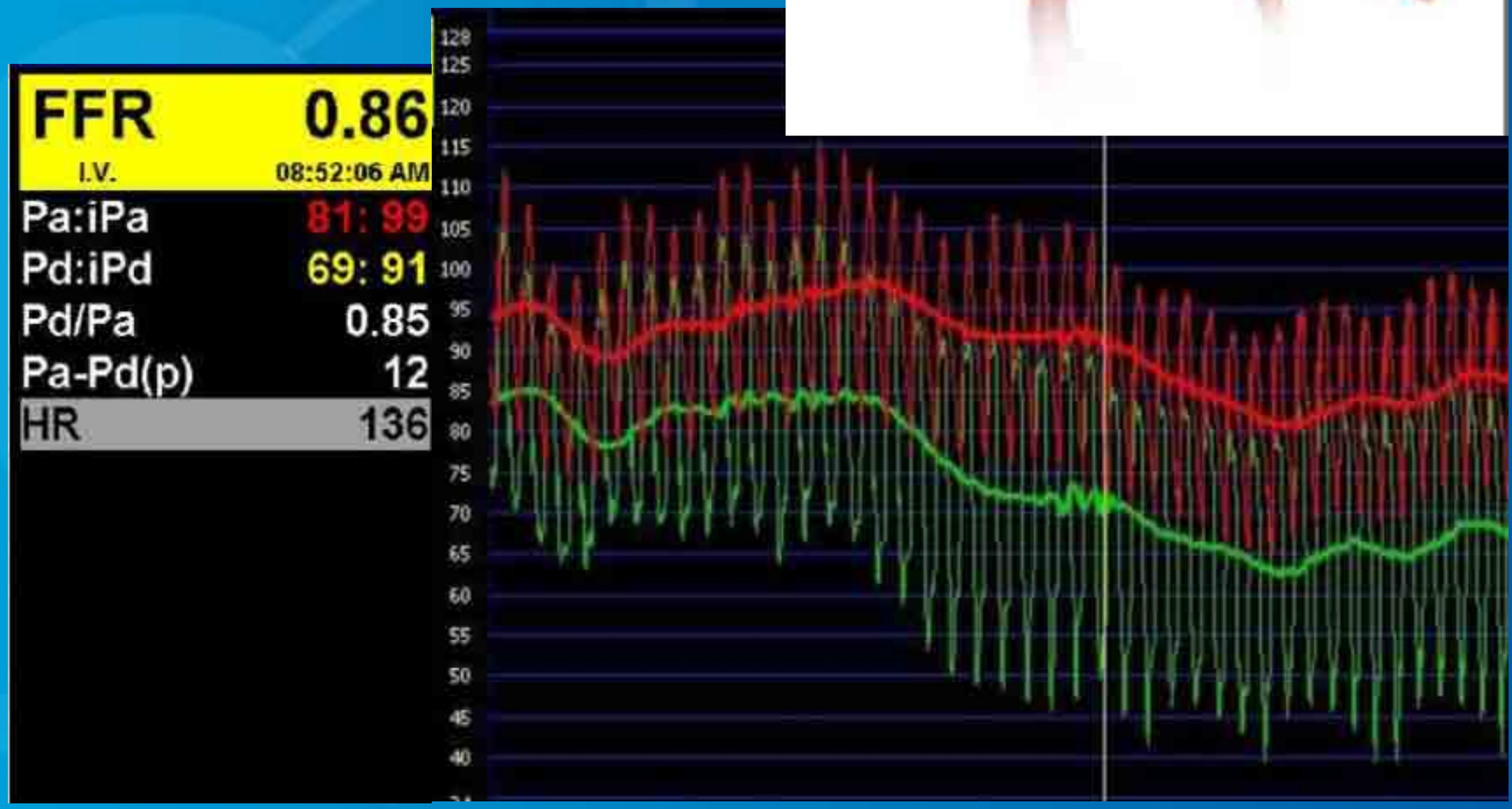
PRECISIÓN de EVALUACIÓN

1) Transductor de presión correcto y zero.
2) Retirar introductor guía del conector Y.
3) Equalizar catéter guía y guía de presión.
4) Cruce la lesión 2-3 cm distal
5) Adenosina EV 2-4 minutos
6) Confirme exactitud con pull back de la guía de presión

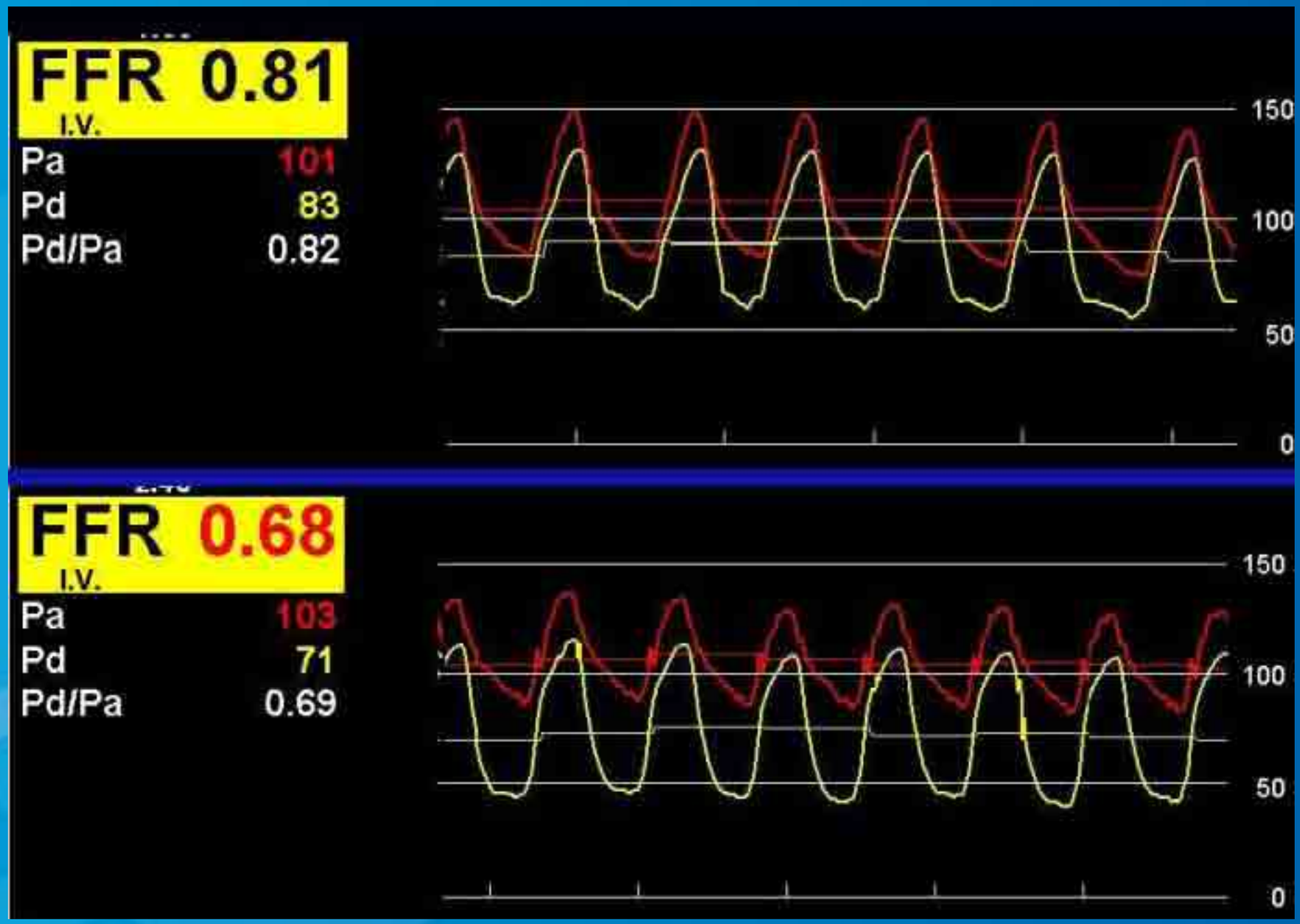


FFR detecta isquemia. Evaluación funcional





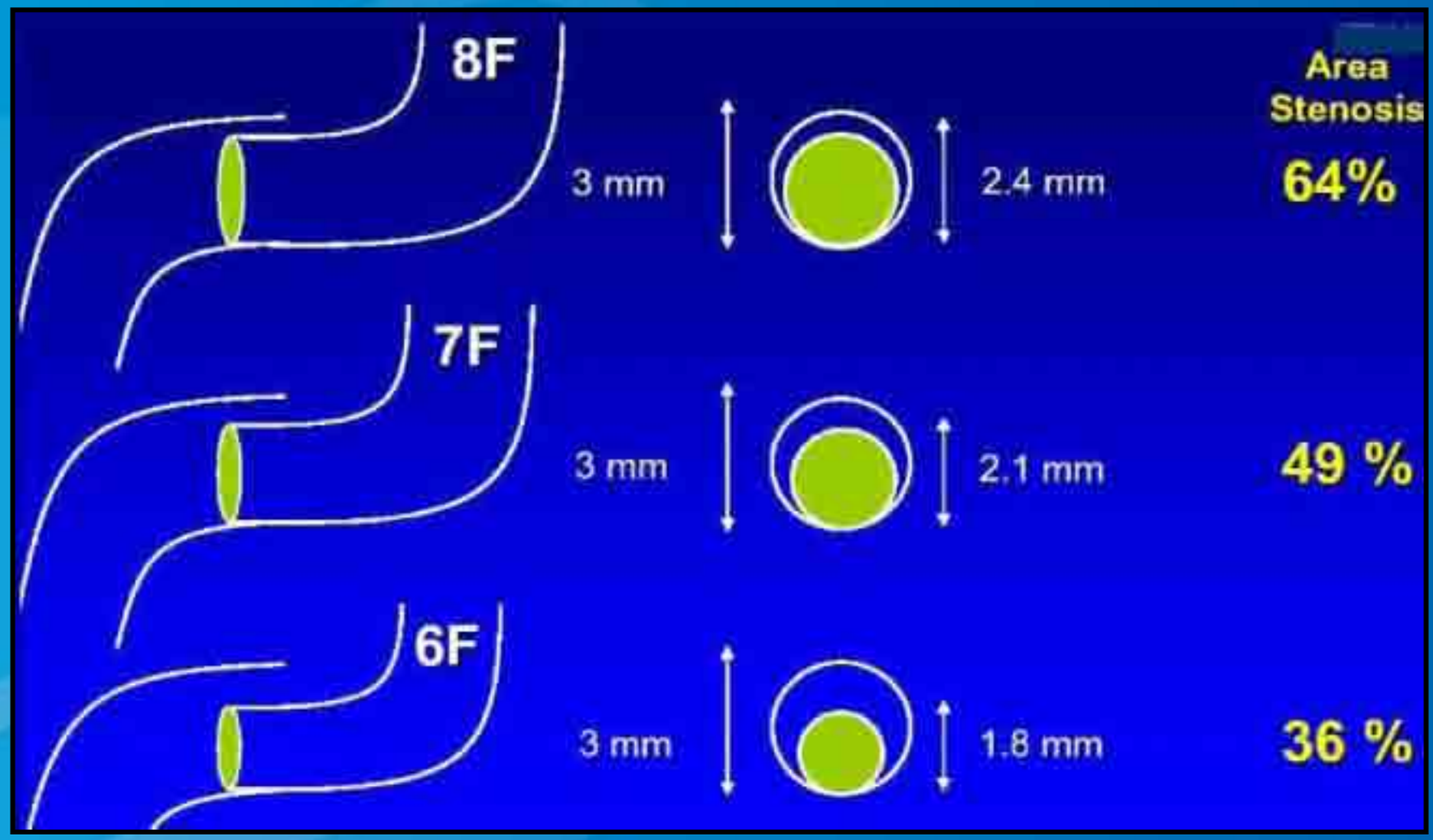
FFR detecta isquemia. Evaluación funcional



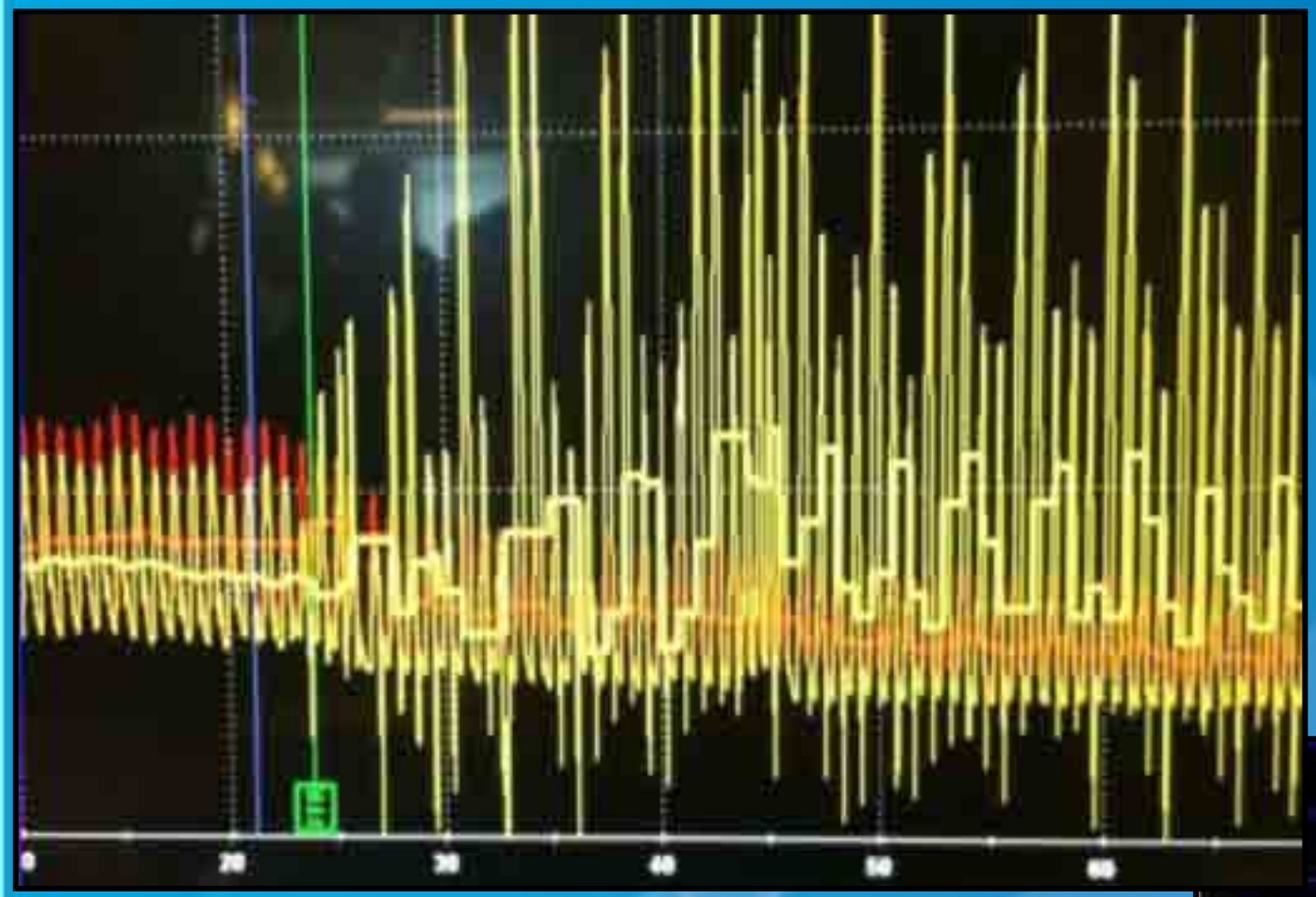
FFR, drogas para hiperemia

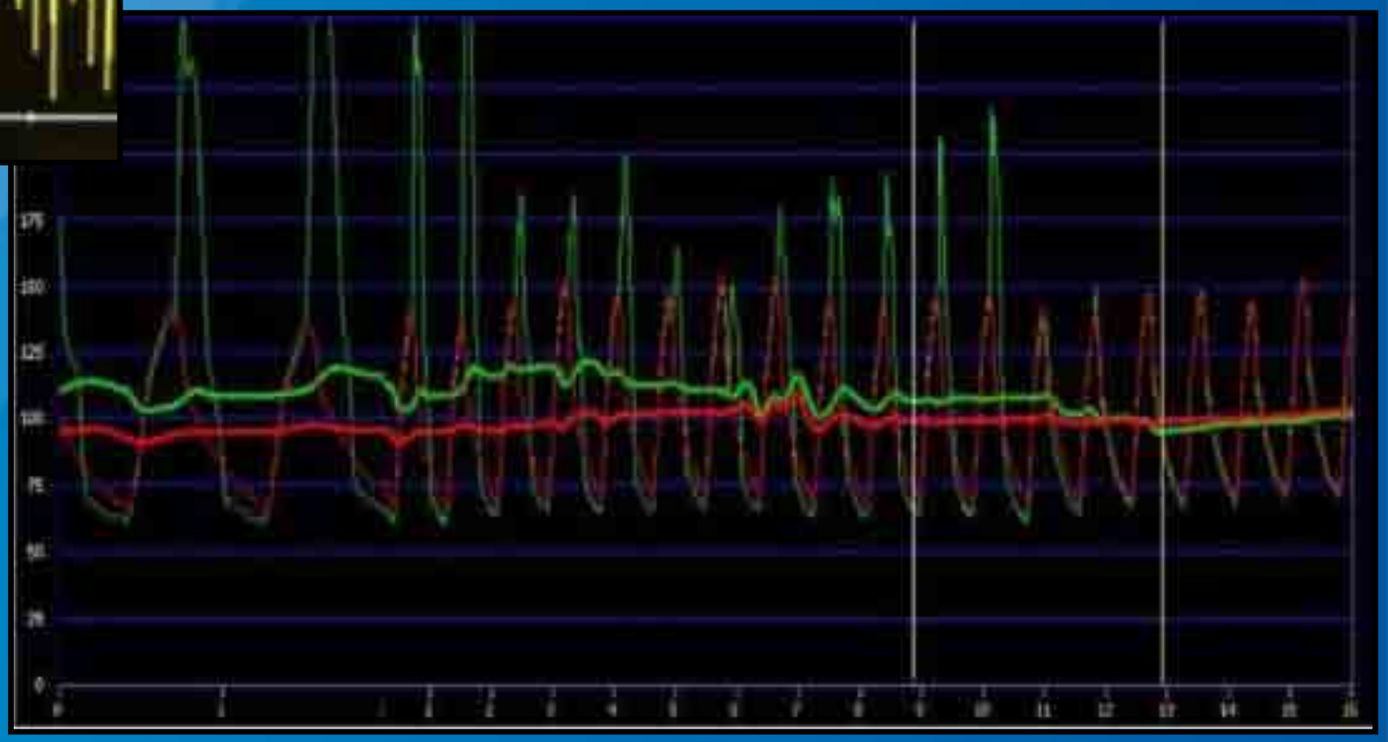
	Adenosine	Adenosine	Papaverine	NTP
Route	IV	IC	IC	IC
Dosage	140 mcg/kg/min	30-60 mcg LCA 20-30 mcg RCA	15 mg LCA 10 mg RCA	50-100 mcg
T 1/2	1 – 2 min	30-60 sec	2 min	1-2min
Time to max	≤1 – 2 min	5-10 sec	30 - 60 sec	10-20sec
Advantage	Gold Standard	Short action	Short action	Short action
Disadvantage	↓BP by 10-15%, Chest burning	AV delay, ↓BP	Torsades, severe ↓BP	↓BP by 10-15%

FFR: tamaño del catéter guía, damping de presión. Mayor no es mejor

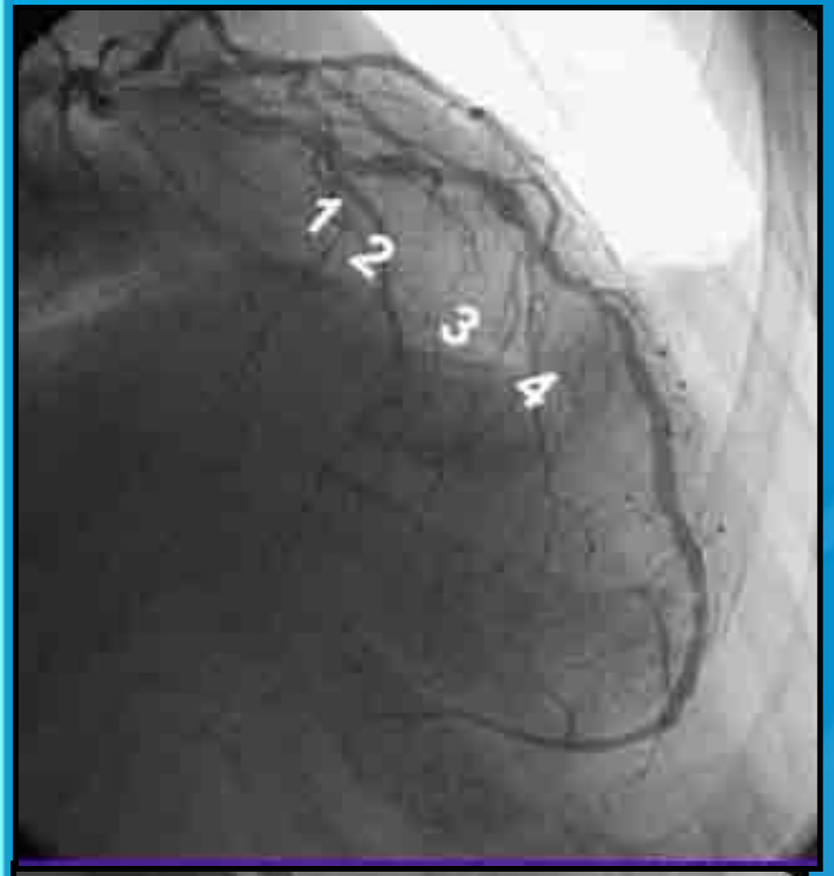


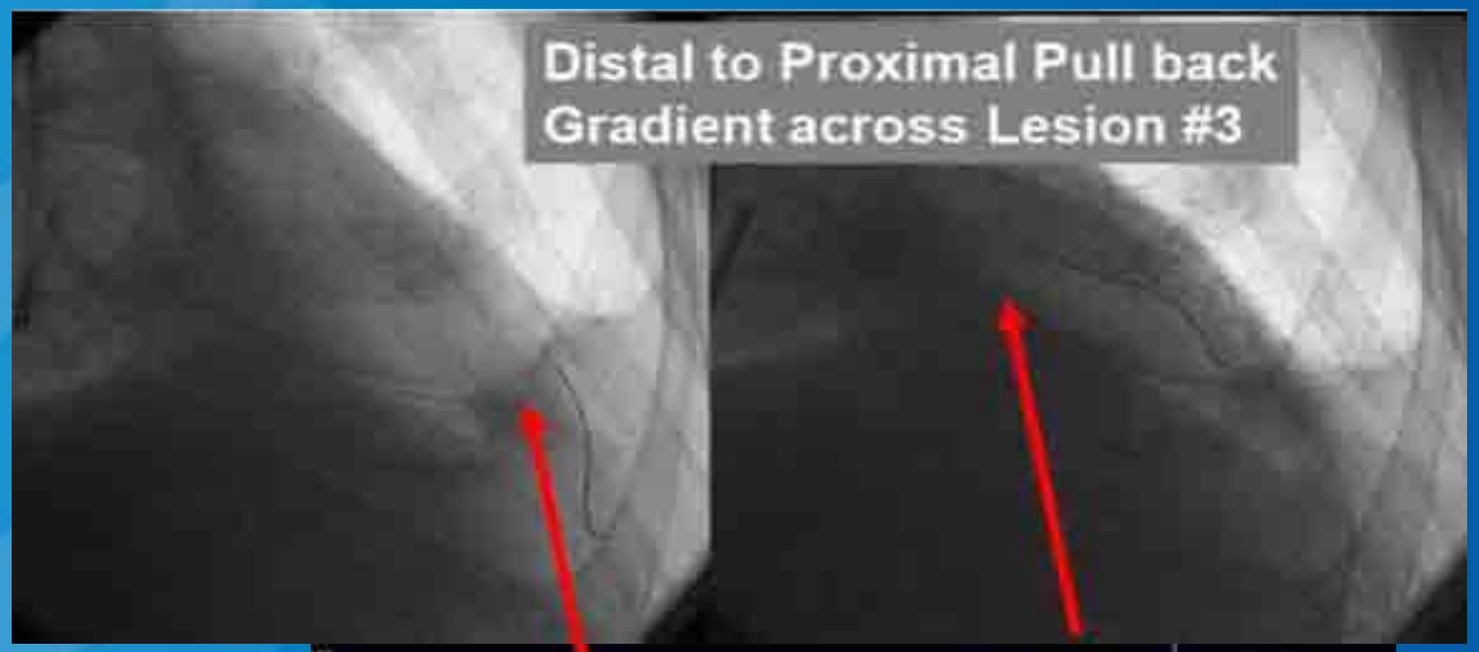
Transductor contacta com lesión calcificada em la pared vascular

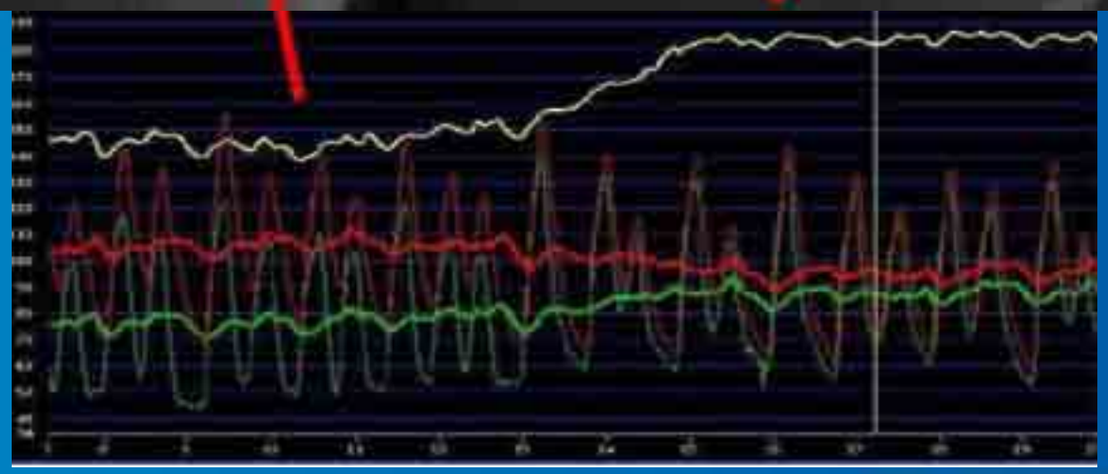




FFR y lesiones seriadas







Fractional Flow Reserve Guidelines

Tabela 15. Medida de pressão intracoronária e reserva fracionada de fluxo do miocárdio

	Recomendação	Nível de evidência
Alternativa à realização de teste não-invasivo de isquemia (inviável ou inconclusivo) para determinar a necessidade de ICP	IIa	B
Avaliação de estenose moderada (50%-70%)	IIa	B
Monitoração rotineira da ICP com stents coronários	IIb	B

Recommendation	COR	LOE
FFR to assess angiographic intermediate coronary lesions and to guide revascularization decisions in patients with SIHD	IIa	A

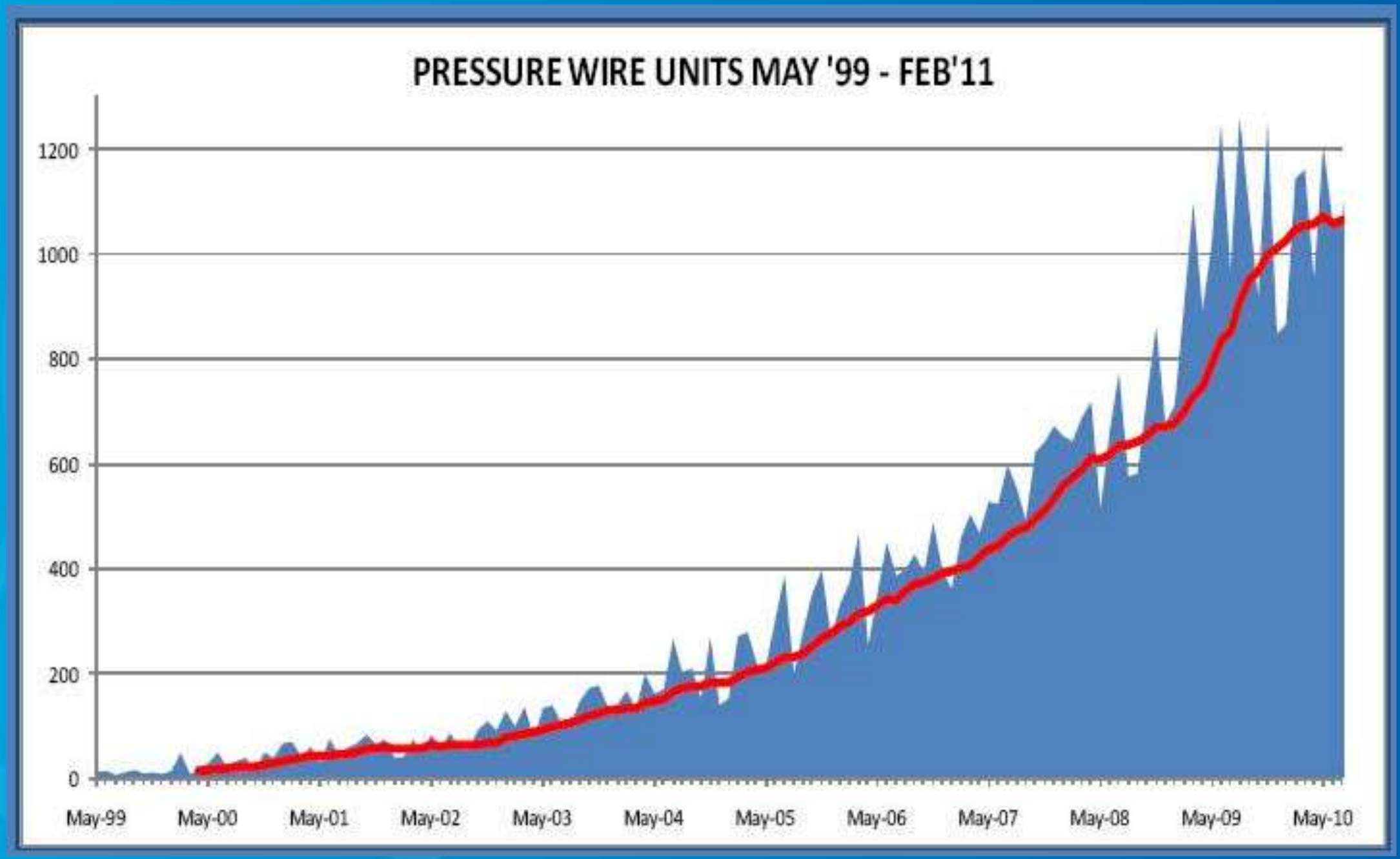
Table 33 Recommendations for specific percutaneous coronary intervention devices and pharmacotherapy

	Class[a]	Level[b]	Ref.[c]
FFR-guided PCI is recommended for detection of ischaemia-related lesion(s) when objective evidence of vessel-related ischaemia is not available.	I	A	15, 28

2008 Arq Bras Cardiol 2008;91
European Heart Journal (2010) 31, 2501–2555
2011 ACCF/AHA/SCAI Guideline for PCI and Coronary Revascularization

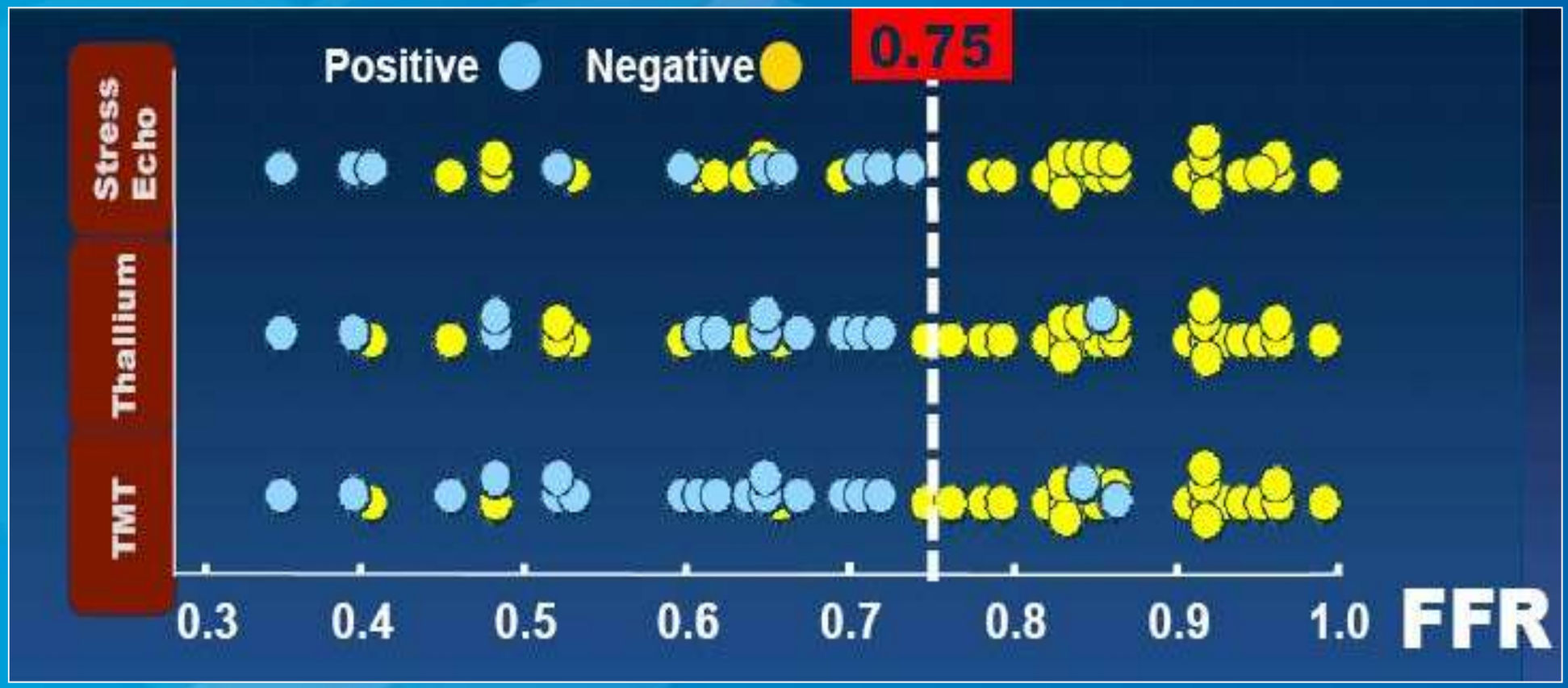
Industry data – FFR Growth 1999-2010

Pressure Wire Units 2010 = 14,500 (16% of all PCI)



Primera Validación de FFR !!!

Comparison with 3 non-invasive functional studies



- N = 45 patients
- Sensitivity 88%, Specificity 100%, PPV 100%, NPV 88%

N Engl J Med 1996;334:1703-8

Estudio DEFER

TABLE 2. Angiographic Data and FFR Results

	FFR ≥0.75		FFR <0.75:
	Deferral Group (n=91)	Performance Group (n=90)	Reference Group (n=144)
Target coronary artery, %			
Left anterior descending	52	48	51
Right	23	24	38*
Left circumflex	25	28	12*
Baseline severity of CAD, %			
Single-vessel disease	65	68	74
Two-vessel disease	27	29	22
Three-vessel disease	8	3	4
FFR by adenosine			
Intravenously (n=188)	0.87±0.06	0.86±0.07	0.56±0.16*
Intracoronary (n=137)	0.86±0.07	0.88±0.07	0.58±0.16*
Angiography at baseline			
Reference diameter, mm	3.00±0.64	2.94±0.57	2.97±0.58
Percent stenosis	48±9	48±10	57±12*
Minimal lumen diameter, mm	1.55±0.37	1.50±0.36	1.28±0.39*

Circulation 2001, 103:2928-2934

Rationale and design of the fractional flow reserve versus angiography for multivessel evaluation (FAME) study

William F. Fearon, MD,[a] Pim A.L. Tonino, MD,[b] Bernard De Bruyne, MD, PhD,[c] Uwe Siebert, MD, MSc, MPH, ScD,[d,e] and Nico H.J. Pijls, MD, PhD,[b] for the FAME Study Investigators *Stanford, CA; Eindhoven, The Netherlands; Aalst, Belgium; Hall i.T., Austria; and Boston, MA*

Inclusion Criteria

1. Age ≥18 y
2. At least 2 ≥50% diameter stenoses in ≥2 major epicardial vessels, both of which the investigator feels require stenting
3. Willing and able to provide informed, written consent

Am Heart J 2007;154:632-6

FAME: características angiográficas

Characteristic	Angiography Group (N=496)	FFR Group (N=509)
Angiographic Findings		
Indicated lesions per patient — no.§	2.7±0.9	2.8±1.0
Extent of occlusion — no. of lesions/total no. (%)		
50–70% narrowing	550/1350 (40.7)	624/1414 (44.1)
71–90% narrowing	553/1350 (41.0)	530/1414 (37.5)
91–99% narrowing	207/1350 (15.3)	202/1414 (14.3)
Total occlusion	40/1350 (3.0)	58/1414 (4.1)
Patients with total occlusion — no. (%)	37 (7.5)	54 (10.6)
Quantitative coronary analysis		
Extent of stenosis — %	61.2±16.6	60.4±17.6
Minimal luminal diameter — mm	1.0±0.4	1.0±0.5
Reference diameter — mm	2.5±0.6	2.5±0.7
Lesion length — mm	12.6±6.9	12.5±6.5
SYNTAX score¶	14.5±8.8	14.5±8.6
EQ-5D score‖	64.7±19.2	66.5±18.3

N Engl J Med 2009;360:213-24.

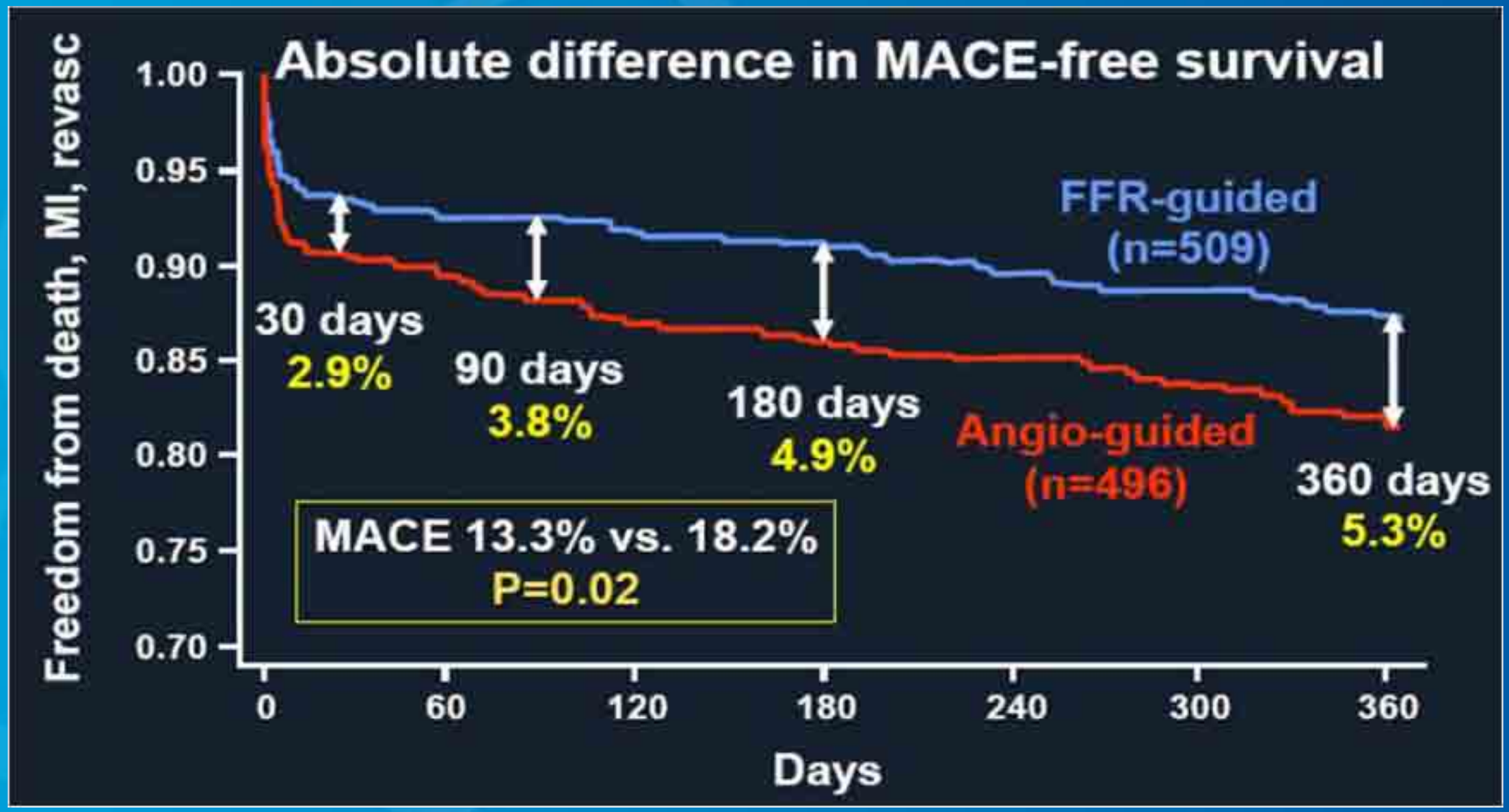
FAME: resultados 1 año

FAME Vs. HCC ** Taxus Experience

	*ANGIO-group N=496	*FFR-group N=509	** HCC TAXUS N= 643
Events at 1 year, No (%)			
MACE	(18.3)	(13.2)	(5.3)
MI	(8.7)	(5.7)	(0.2)
Death	(3.0)	(1.8)	(1.3)
Death or MI	(11.1)	(7.3)	(1.2)
CABG or repeat PCI	(9.5)	(6.5)	(3.5)

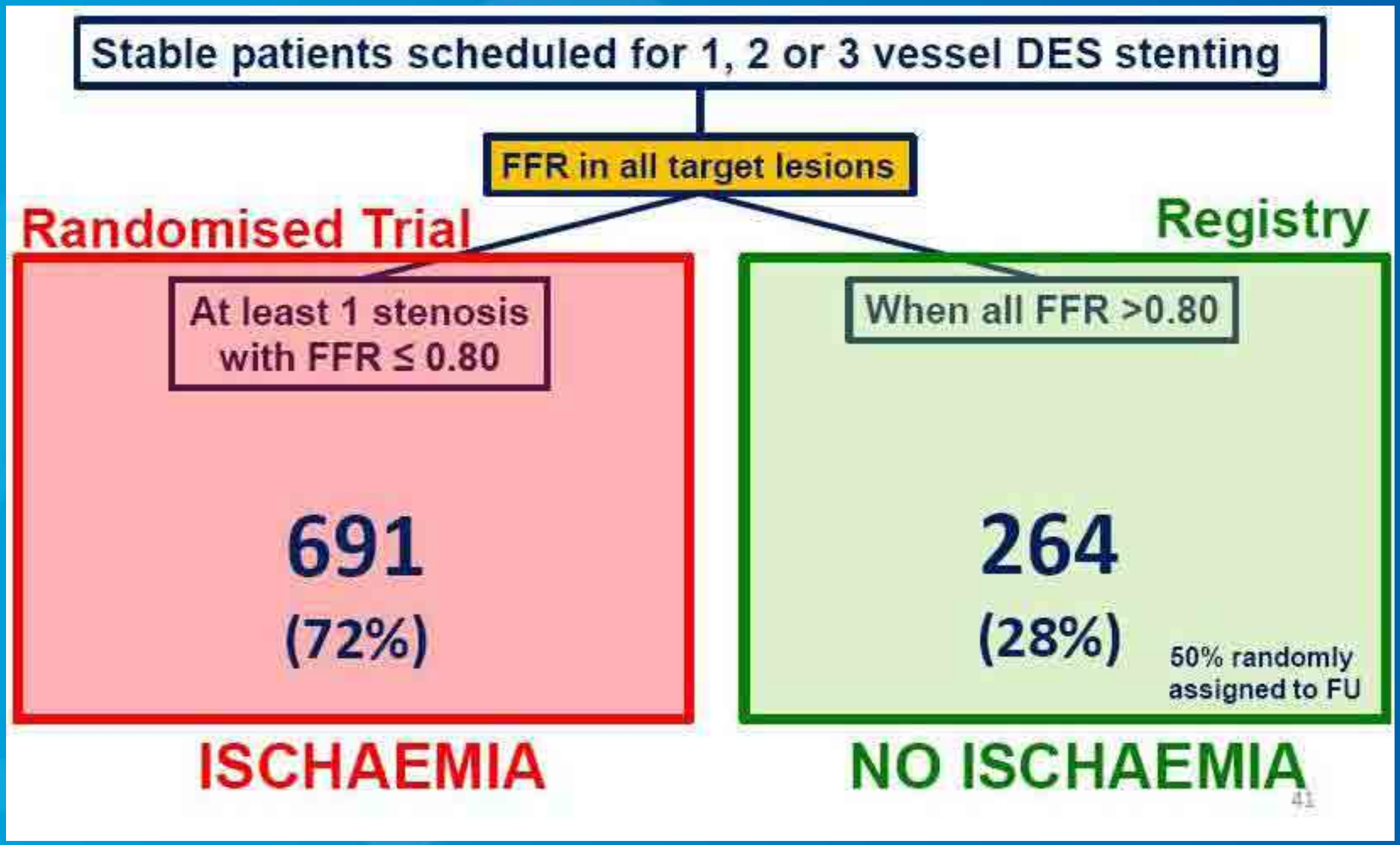
*FAME study: Adverse Events at 1 year ; NEJM 2009;360:213-24
** HCC TAXUS: Adverse Events at 1 year

FAME: Optimizing Complete Revascularization



Tonino PAL et al. NEJM 2009;360:213–24

FAME II
Flow Chart



Oral presentation; Bernard De Bruyne, PCR 2012

FAME II

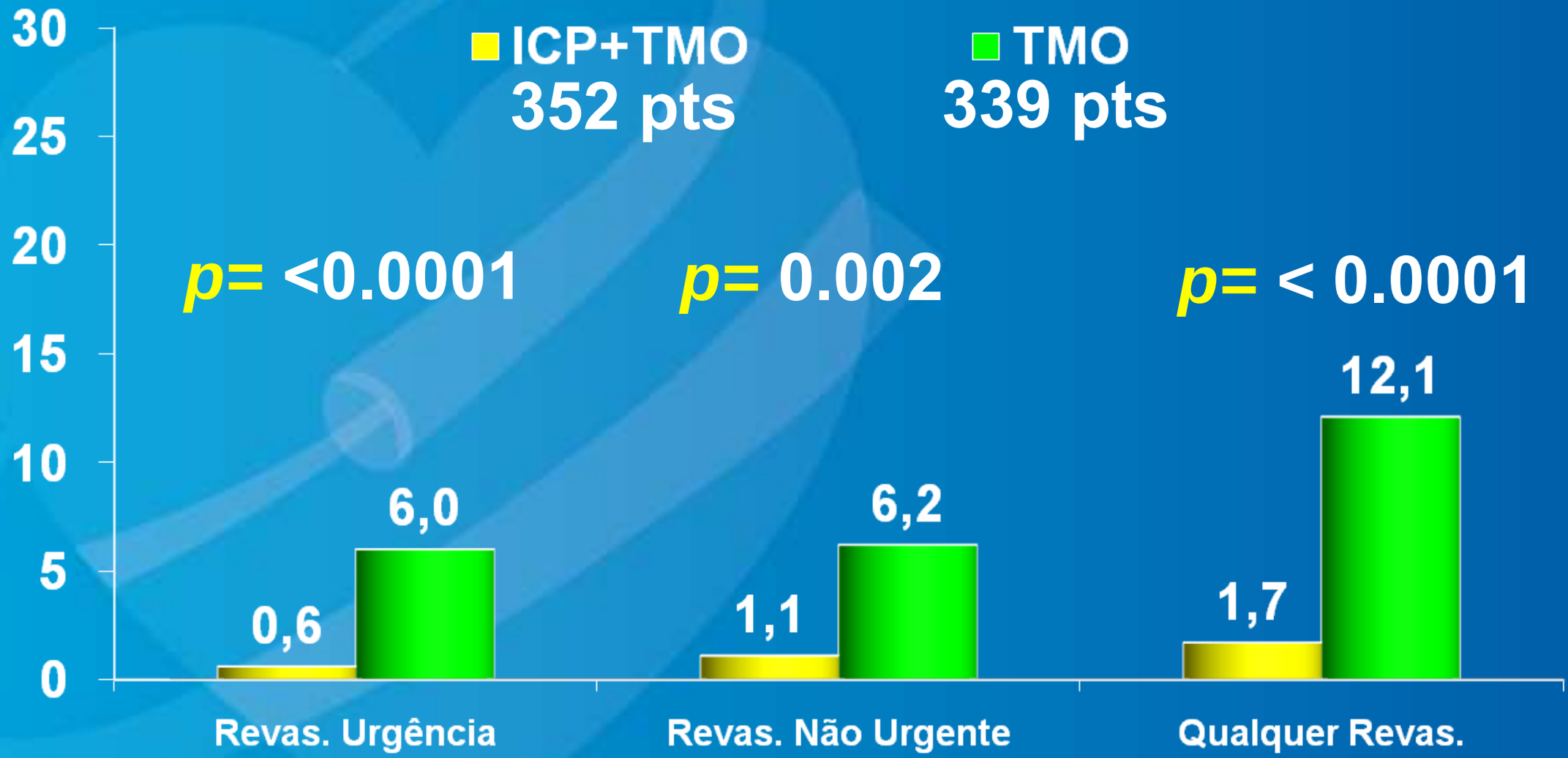
Baseline Angiographic Characteristics

Angiography	Randomised trial N=691		Registry N=264	p
Patients, N	PCI+OMT=352	OMT=339	with FU=131	
Number of Stenoses (>50% DS)	92.7%	92.9%	90.6%	0.29
Mean nb of stenosis per patient†	1.84±1.1	1.73±0.95	1.32±0.6	<.0001
Nb of stenotic vessels per patient*				<.0001
None	0%	0%	1.5%	
One	57.4%	58.5%	80.9%	
Two	34.6%	31.9%	16.0%	
Three	8.1%	9.6%	2.3%	NA
Proximal or Mid-LAD stenosis	35.9%	36.0%	32.5%	0.35
In-stent restenosis	5.4%	4.7%	10.0%	0.049
Bifurcations	12.1%	10.3%	9.4%	0.19
Percent Diameter Stenosis				<.0001
<50%	7.3%	6.9%	8.9%	
50-69%	36.6%	40.6%	74.4%	
70-90%	41.9%	40.1%	14.7%	
>90%	10.0%	9.6%	0%	
Total occlusions	4.2%	2.7%	2.1%	

Oral presentation; Bernard De Bruyne, PCR 2012

Taxas de Revascularização dentre os pacientes Randomizados para ICP+TMO e TMO Sozinha

FAME II



Oral presentation; Bernard De Bruyne, PCR 2012

Fractional Flow Reserve

Methodology What has changed ???

0.75 ---------- 0.80

1995 to 2011

Protocol for IC adenosine or ATP administratio recommends doses of 15–20 µg in the
right coronary artery (RCA) and 18–24 µg in the left coronary artery (LCA)

Piils NH.J. N Engl J Med 1996;334:1703–8

ADENOSINE: 24 µg Left Coronary artery, 18 µg Right Coronary artery

Costantino Costantini; SOLACI 1998

(140 g/kg/min) or intracoronary (15 µg in RCA or 20 µg in the left coronary artery).

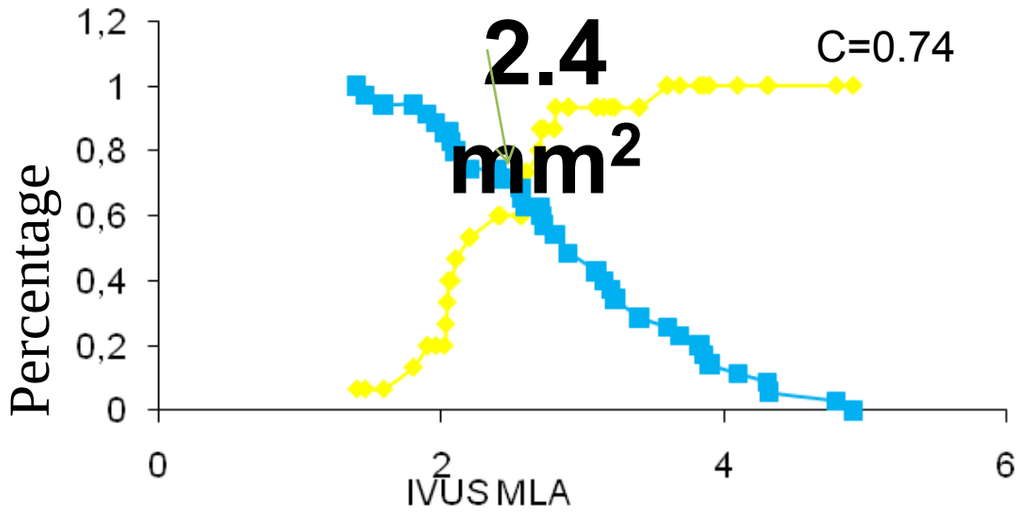
DEFER Study // Circulation 2001, 103:2928-2934

After complete hyperemia has been achieved with intravenous adenosine,
administered at 140 µg/(kgd min) via a central vein.

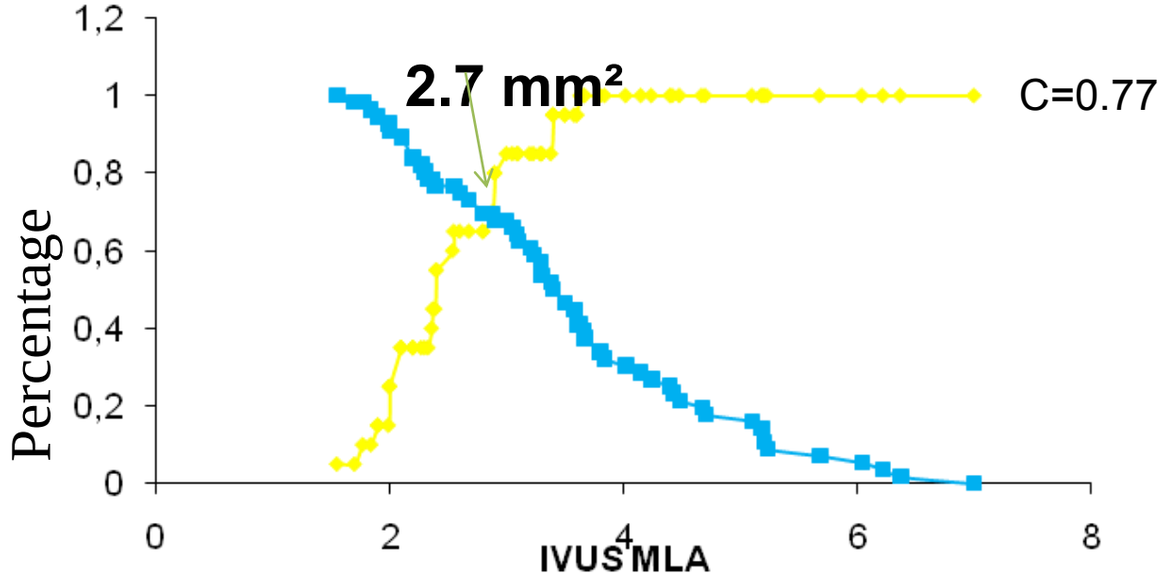
FAME Study // Am Heart J 2007;154:632-6

Correlation between FFR and IVUS lumen area in intermediate coronary artery stenosis

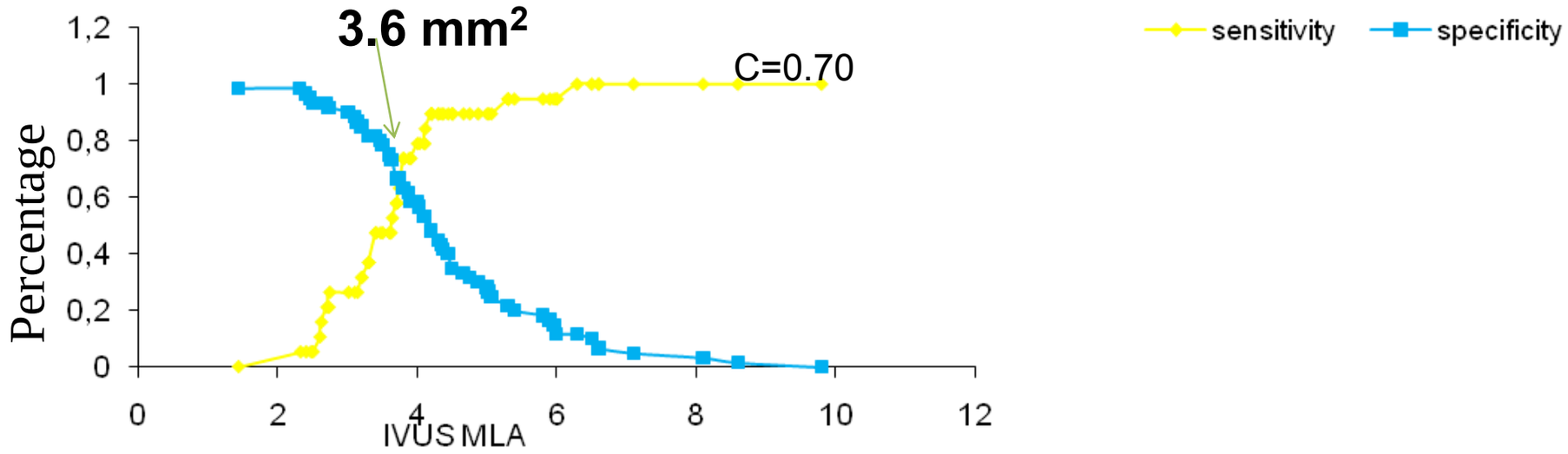
Reference vessel 2.5-3mm



Reference vessel 3-3.5mm



Reference vessel >3.5mm



Ben-Dor et al. Eurointervension 2011 7:225-33

CONCLUSIONES

1) Más um método funcional para definir conductas en lesiones estenóticas intermedias.

2) Considerar técnicamente el control de los diferentes parámetros para um resultado confiable.

3) Considerar los falsos negativos y positivos del método.