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RESERVA DE FLUXO CORONARIANO E INOVAÇÕES EM CARDIOLOGIA

Em que cenários clínicos a análise da reserva de fluxo miocárdico pode ajudar

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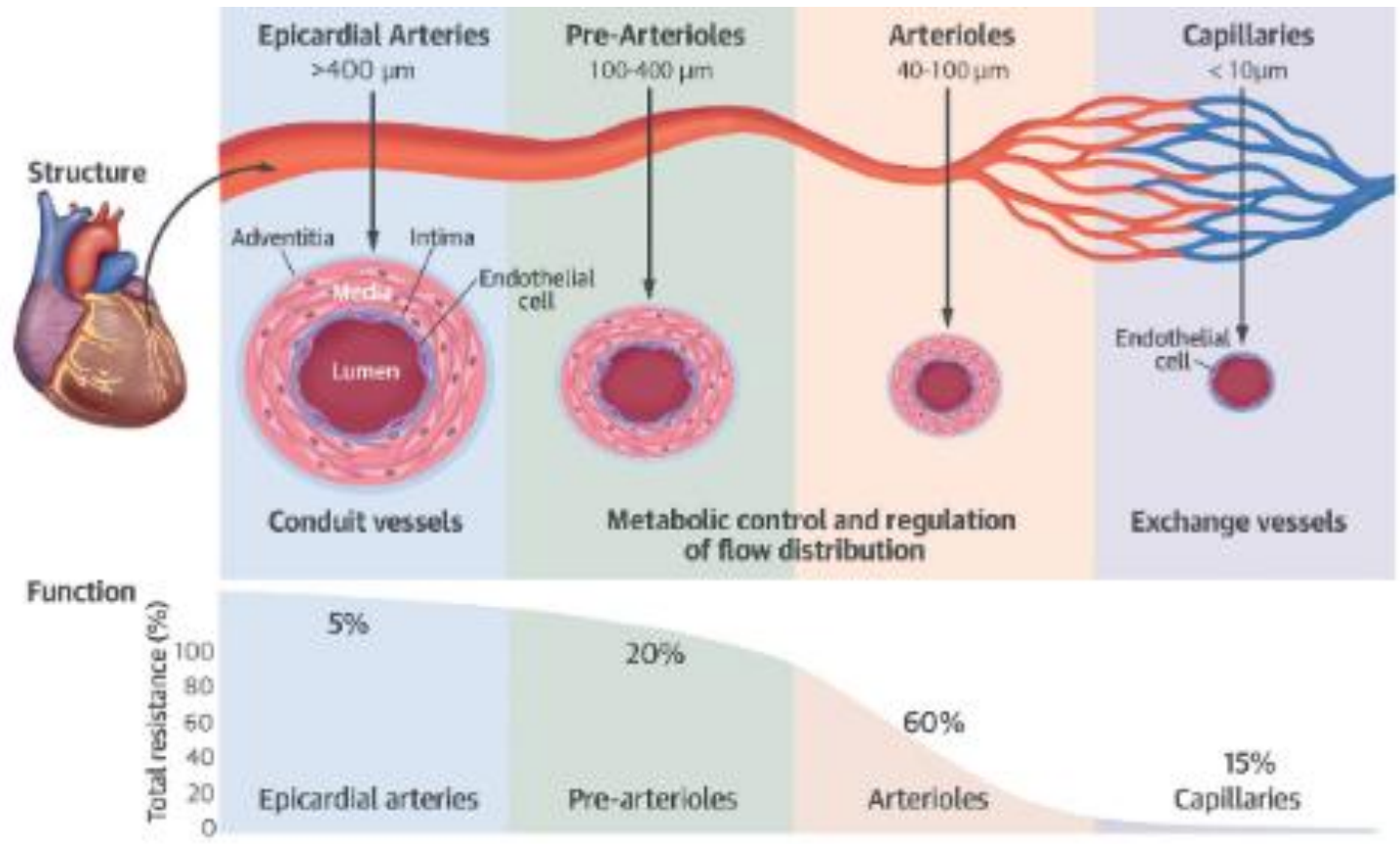
Coordenador da Medicina Nuclear da Fonte Imagem e do DASA-RJ

Table 1. Change in the epidemiology of cardiovascular risk factors in the USA over the last 60 years

Risk Factor	1967 Era (Best available data)	2026 Era (Latest NHANES)
Smoking	~42%-45%	~11%-12%
Obesity (BMI ≥30)	~13.4%	~40%
Hypertension	~15%	~48%
Diagnosed diabetes	~1.5%-2%	~15%-16%
High total cholesterol (≥240 mg/dL)	~30%-33%	~11%
Mean total cholesterol	~222 mg/dL	~189 mg/dL
Physical inactivity	High; structured exercise uncommon (leisure exercise rare)	~25%-30% insufficiently active
Diet quality	High saturated fat (~15% calories), low fiber	Lower trans fats; high sodium/ultra-processed
CKM syndrome	Obesity/diabetes rare; advanced CKD less prevalent	~90% adults have ≥1 CKM stage

Sources: National Center for Health Statistics, U.S. Center for Disease Control and Prevention. <https://www.cdc.gov/nchs/data/hestat/hestat111.htm>; Wadhera RK, Dhruva SS, Bikdeli B, Bonaca MP, Kittleson MM, Ko DT et al. [2].

Macro e microcirculação coronariana – estrutura e função



O valor prognóstico da reserva de fluxo e sua relação com o gênero

TABLE 1 Patient Characteristics

	Women (n = 6,622)	Men (n = 5,927)	P Value
Age, y	69.0 ± 11.9	66.9 ± 12.2	<0.001
Body mass index, kg/m ²	29.50 ± 7.35	29.89 ± 5.30	<0.001
Hypertension	5,097 (77.0)	4,716 (79.6)	<0.001
Diabetes	1,722 (26.0)	1,750 (29.5)	<0.001
Prior MI/revascularization	1,094 (16.5)	1,744 (29.5)	<0.001
Dyslipidemia	4,810 (72.6)	4,601 (77.6)	<0.001
Smoker	825 (12.5)	895 (15.1)	<0.001
Prior stroke/TIA	614 (9.3)	457 (7.7)	0.001
Patient status			<0.001
Inpatient	2,745 (41.5)	2,114 (35.7)	
Outpatient	3,877 (58.6)	3,813 (64.3)	
90-d revascularization	325 (4.9)	572 (9.7)	<0.001
Chest pain	4,334 (65.5)	3,126 (52.7)	<0.001
Dyspnea	3,502 (52.9)	2,649 (44.7)	<0.001
Aspirin	4,068 (61.4)	4,066 (68.6)	<0.001
Beta-blocker	2,550 (38.5)	2,623 (44.3)	<0.001
Statin	2,080 (31.4)	2,224 (37.5)	<0.001
ECG response			
Equivocal	132 (2.0)	46 (0.8)	
Ischemic	336 (5.1)	152 (2.6)	<0.001
Nondiagnostic	1,286 (19.4)	953 (16.1)	
Nonischemic	4,868 (73.5)	4,776 (80.6)	
Rest LVEF, %	65.88 ± 11.68	57.33 ± 14.18	<0.001
% scar >0%	799 (12.1)	1,243 (21.0)	<0.001
Ischemia			
None (0%)	4,949 (74.7)	3,549 (59.9)	
Mild-moderate (1%-10%)	1,158 (17.5)	1,480 (25.0)	<0.001
Severe (≥10%)	515 (7.8)	898 (15.2)	
Rest MBF, mL/min/g	0.86 (0.69-1.07)	0.67 (0.55-0.84)	<0.001 ^a
Stress MBF, mL/min/g	1.66 (1.33-2.07)	1.36 (1.08-1.71)	0.83 ^b
Global MBFR	1.96 ± 0.53	2.04 ± 0.59	<0.001

JACC: CARDIOVASCULAR IMAGING
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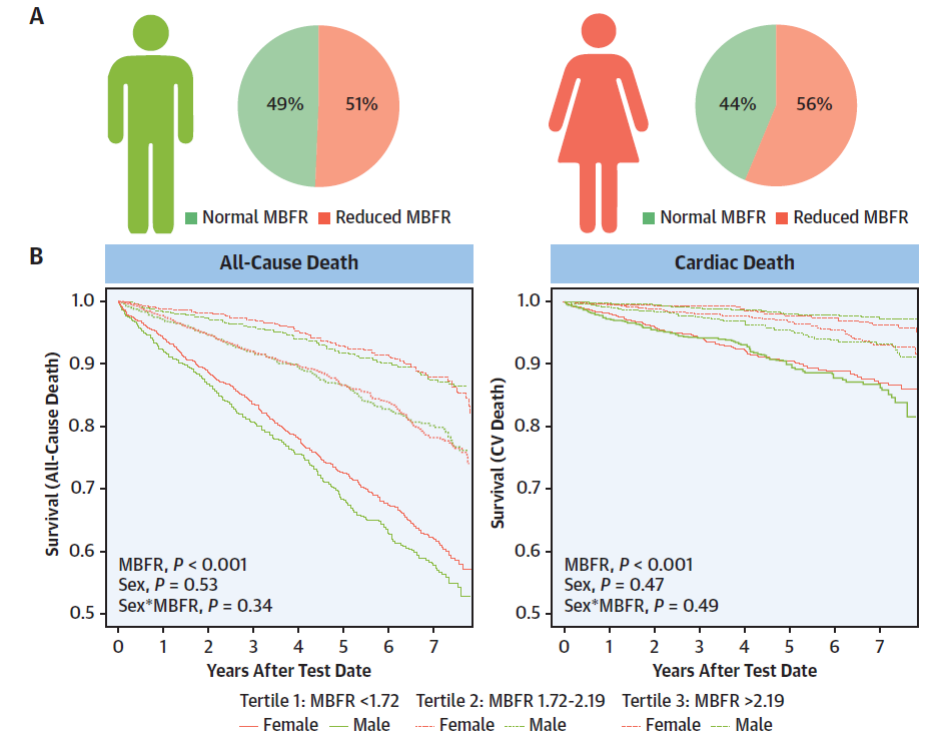
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ORIGINAL RESEARCH

Association of Sex, Reduced Myocardial Flow Reserve and Long-term Mortality Across Spectrum of Atherosclerotic Disease

Krishna K. Patel, MD, MSc,^{a,b,c} Leslee Shaw, PhD,^a John A. Spertus, MD, MPH,^{b,c} Brett Sperry, MD,^{b,c} A. Iain McGhie, MD,^{b,c} Kevin Kennedy, MS,^b Randall C. Thompson, MD,^{b,c} Paul S. Chan, MD, MSc,^{b,c} Timothy M. Bateman, MD^{b,c}

CENTRAL ILLUSTRATION Prevalence and Prognosis of Reduced Myocardial Flow Reserve Among Men and Women with Suspected or Known Coronary Artery Disease

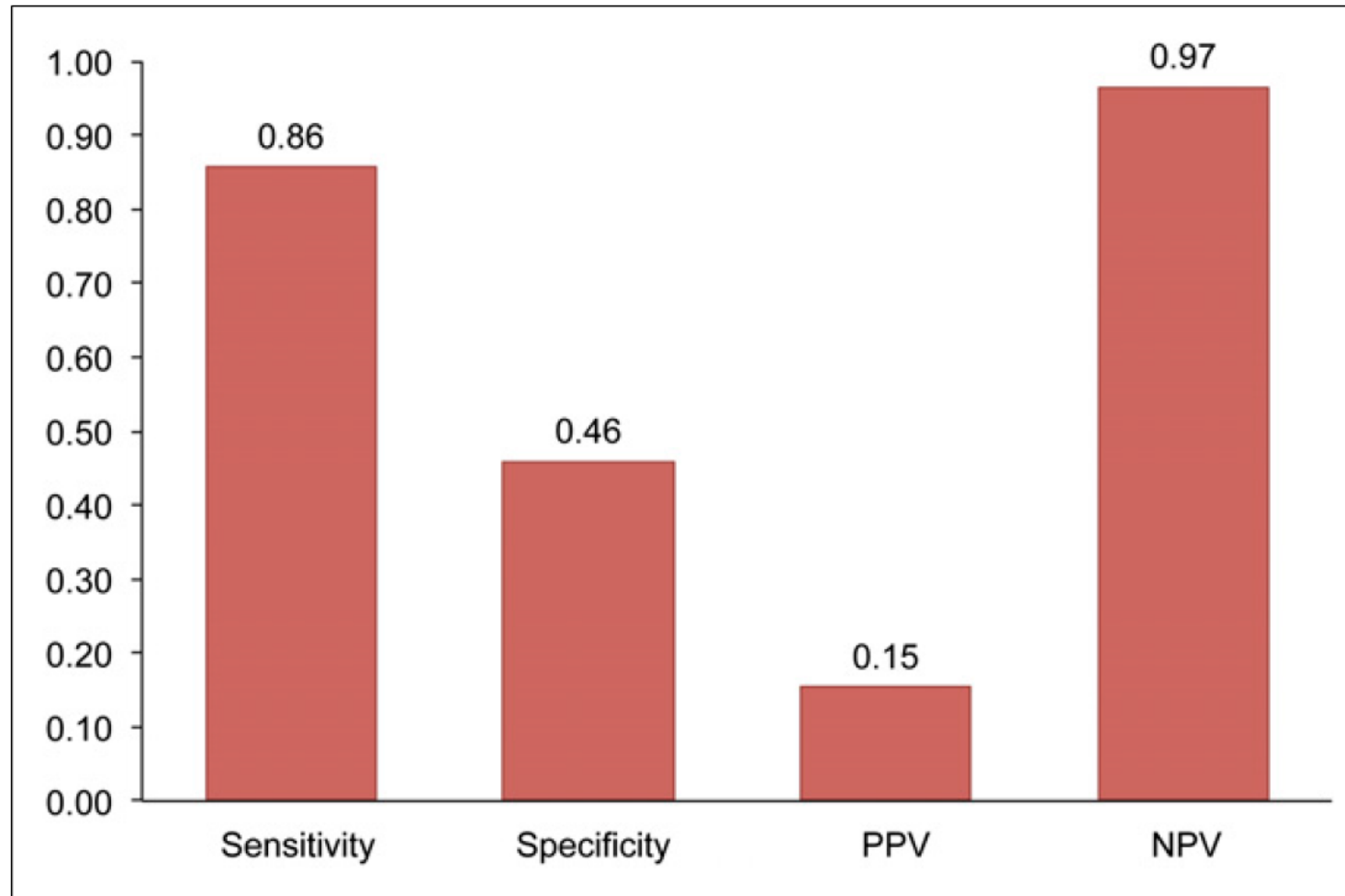


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	Adjusted Hazard Ratio All Cause Death (95% CI)	P-value	Adjusted Hazard Ratio Cardiac Death (95% CI)	P-value
Female Sex	0.94 (0.85, 1.05)	0.27	1.08 (0.89, 1.31)	0.46
MBFR (per 0.1 ↓)	1.09 (1.08, 1.10)	< 0.0001	1.10 (1.08, 1.12)	< 0.0001
Sex*MBFR		0.22		0.35

Patel KK, et al. J Am Coll Cardiol Img. 2022;■(■):■-■.

A avaliação de reserva de fluxo exclui doença multivascular?

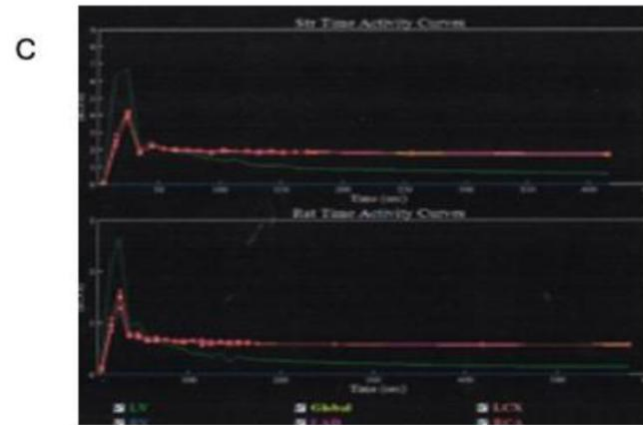
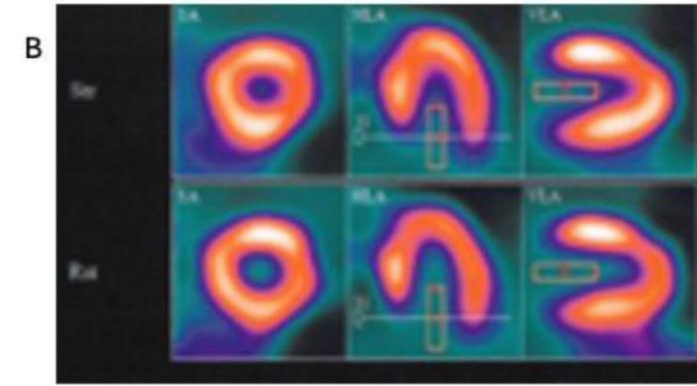
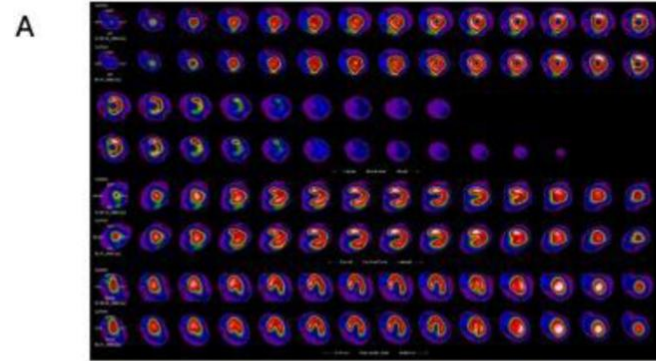


Em que situações a reserva de fluxo pode fazer a diferença?

- 1) O paciente tem uma perfusão normal mas tem alto risco para DAC**
- 2) O paciente tem pouca isquemia mas pode ser multivascular**
- 3) O paciente permanece com angina após angioplastia**
- 4) Identificação de doença microvascular**
- 5) Determinar o sucesso do vasodilatador**

Uma mulher de 68 anos com HA, dislipidemia e histórico de angina há 3 anos foi submetida a CAT, que revelou estenose de 75% no primeiro ramo marginal obtuso. Um stent farmacológico foi implantado em 11/2021. Três meses depois, com angina persistente, a paciente foi submetida a SPECT MPI com estresse farmacológico utilizando dipiridamol e quantificação do fluxo sanguíneo miocárdico .

A cintilografia de perfusão foi normal; no entanto, o FSM absoluto e a reserva de fluxo miocárdico estavam reduzidos global e segmentarmente, compatíveis com disfunção microvascular coronária .



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	Stress	Rest	Reserve
LAD	0.68	0.86	1.27
LCx	0.58	0.79	1.35
RCA	0.64	0.78	1.22
TOTAL	0.64	0.82	1.28

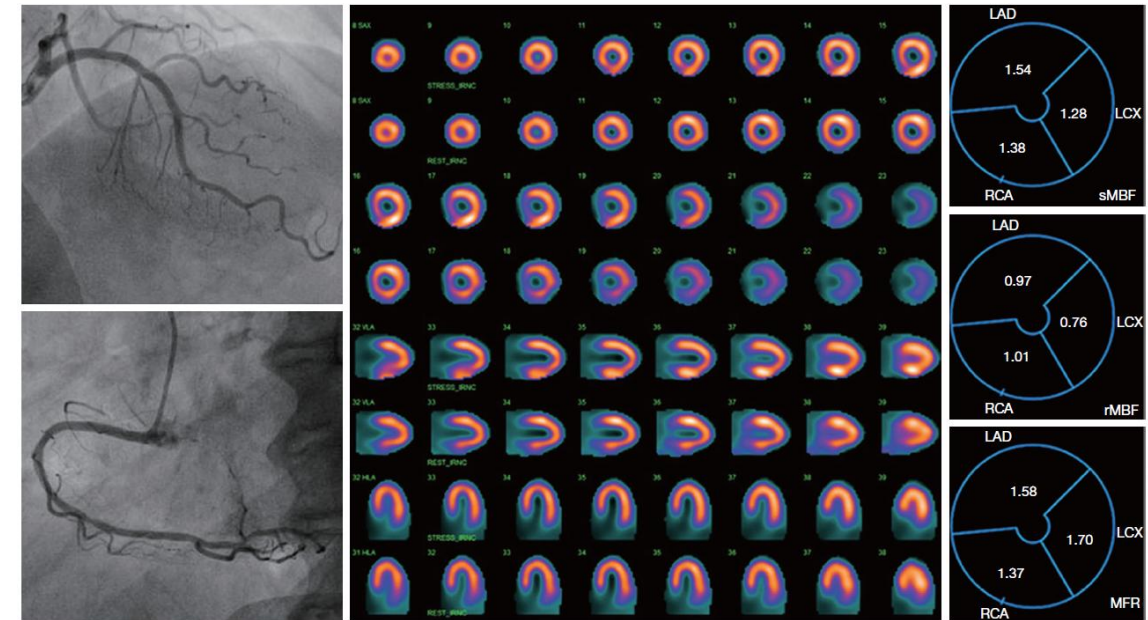
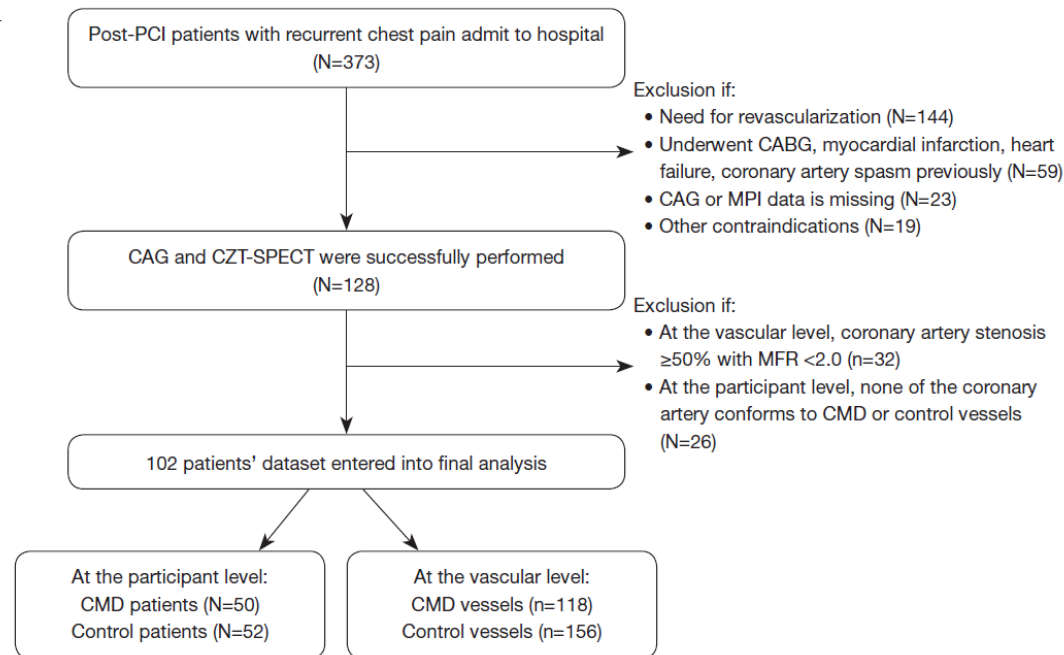
Prevalence and characteristics of coronary microvascular dysfunction in post-percutaneous coronary intervention patients with recurrent chest pain

Lijun Cui^{1,2#^}, Liju Han^{1,2#}, Jiao Wang^{2,3}, Ping Huang^{1,2}, Gang Tian^{1,2}, Yongde Wang^{1,2}, Jianming Li^{2,3}

Table 4 Multivariate logistic regression analysis for the risk factors of CMD

Variable	β	SE	Wald χ^2	OR	95% CI	P
Age	-0.052	0.050	1.085	0.949	0.861–1.047	0.298
Double or three vessel stenosis	0.272	0.672	0.164	1.313	0.352–4.897	0.686
Residual coronary stenosis $\geq 50\%$	-1.467	1.094	1.800	0.231	0.027–1.967	0.180
TC	0.135	0.413	0.106	1.144	0.509–2.570	0.745
LDL-C	1.129	0.555	4.149	3.094	1.044–9.173	0.042
BMI	0.340	0.149	5.185	1.405	1.048–1.882	0.023
T wave inversion	-0.781	0.842	0.859	0.458	0.088–2.387	0.354

CMD, coronary microvascular dysfunction; TC, total cholesterol; LDL-C, low density lipoprotein cholesterol; BMI, body mass index.



Mulher, 58 anos, com queixa de angina intermitente, submetida a ICP há três meses, foi admitida. Figuras à esquerda: CAG não mostrou estenose coronariana significativa e nenhum espasmo óbvio. Figura central: As imagens da CPM mostraram ausência de isquemia. Figuras à direita: foi demonstrado que o MFR estava significativamente diminuído nos três territórios das artérias coronárias (LAD-MFR = 1,58; LCX-MFR = 1,70; RCA-MFR = 1,37), atendendo aos critérios diagnósticos de DMC. Após a administração de nicorandil, os sintomas do paciente foram gradualmente aliviados..

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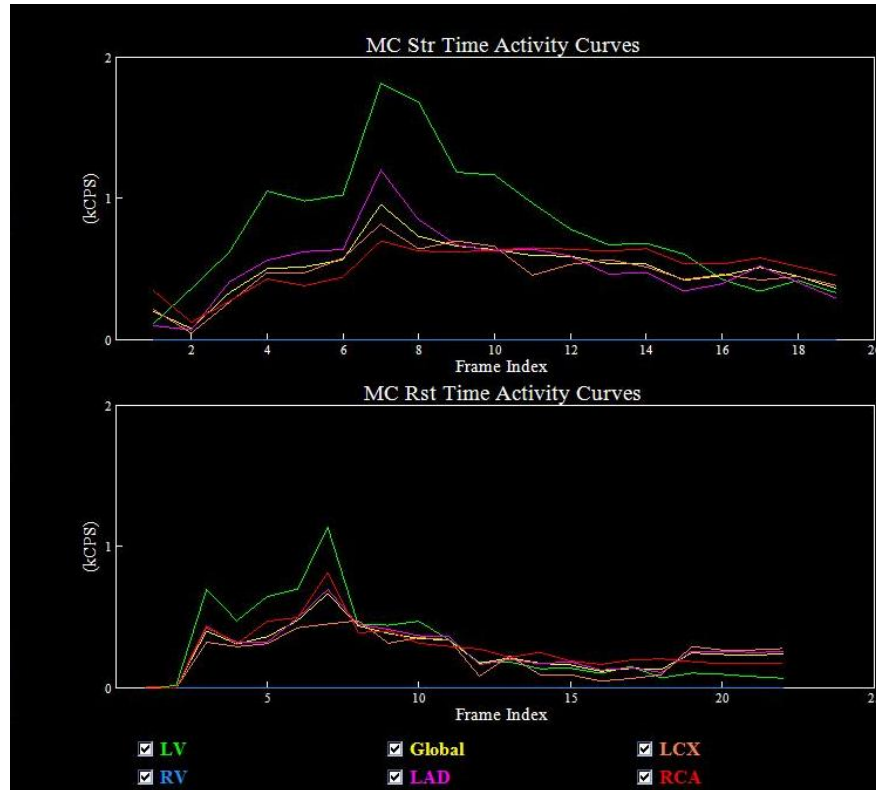
Caso Clínico

**Mulher, 54 anos, lúpica,
hipertensa e dislipidêmica com dor
precordial típica há 2 anos.**

**Cintilografia com dipiridamol foi
negativa para isquemia.**

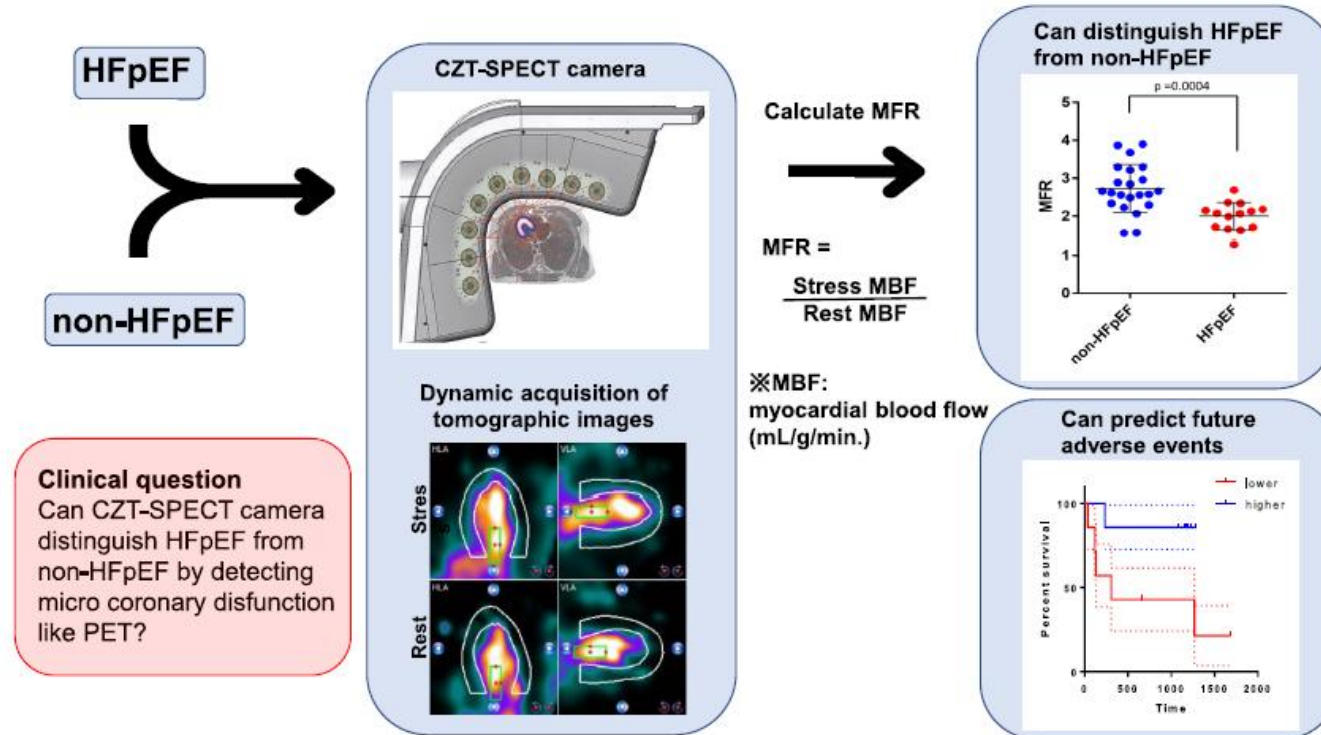
**Coronariografia sem lesões
obstrutivas.**

Reserva de fluxo miocárdico



Resultados globais			
	Fluxo (ml/min/g)		
Região	Estresse	Repouso	Reserva
DA	0,15	0,15	1,00
CX	0,16	0,14	1,12
CD	0,25	0,22	1,16
Total	0,17	0,15	1,18

A reserva de fluxo na ICfEP



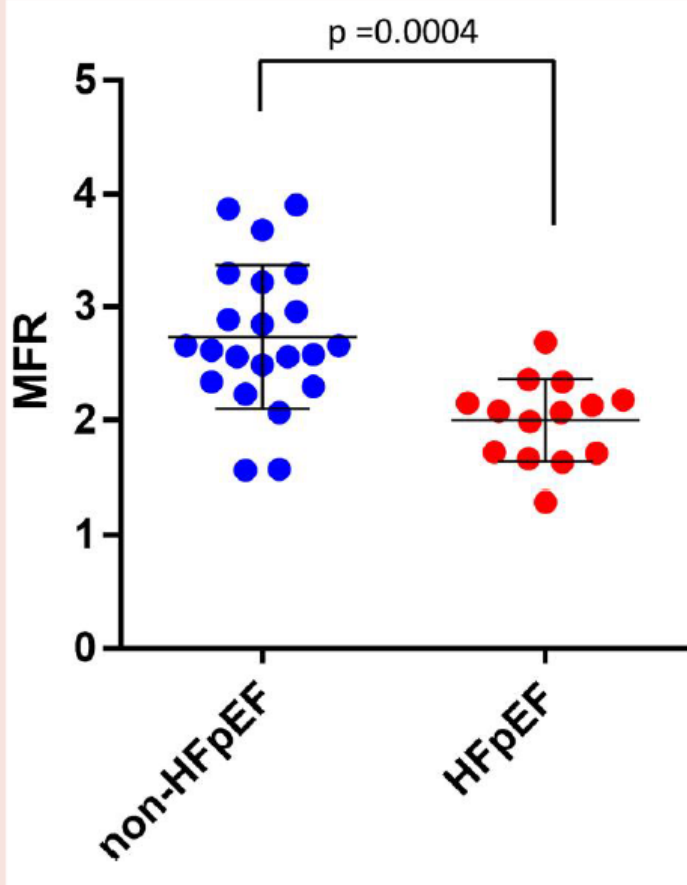


Figure 3 Myocardial flow reserve. Mean ± SEM of non-heart failure with preserved ejection fraction ($n = 22$) and heart failure with preserved ejection fraction ($n = 14$) are 2.74 ± 0.14 and 2.00 ± 0.097 , respectively. 95% Confidence interval is -1.12 to -0.35 . $P = 0.0004$ (two-tailed unpaired t-test).

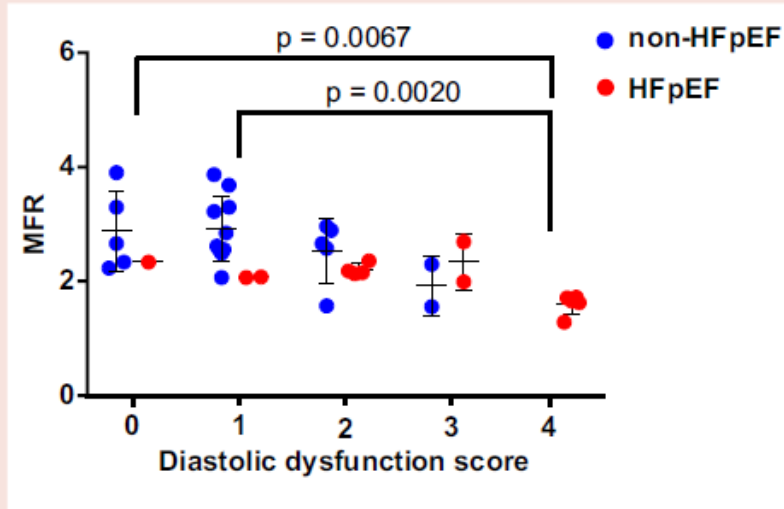


Figure 5 Relationship between myocardial flow reserve and diastolic dysfunction score. Based on echocardiographic parameters, each case was classified into five grades: 0–4. The parameters used for scoring were average $E/e' > 14$, septal e' velocity < 7 cm/s, TR systolic jet velocity > 2.8 m/s and left atrial volume index > 34 mL/m². None of the patients in the non-heart failure with preserved ejection fraction group scored 4 points.

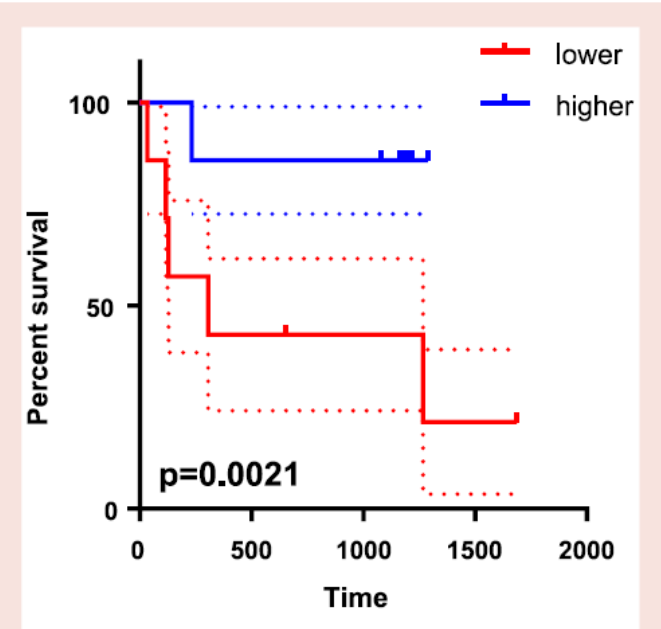
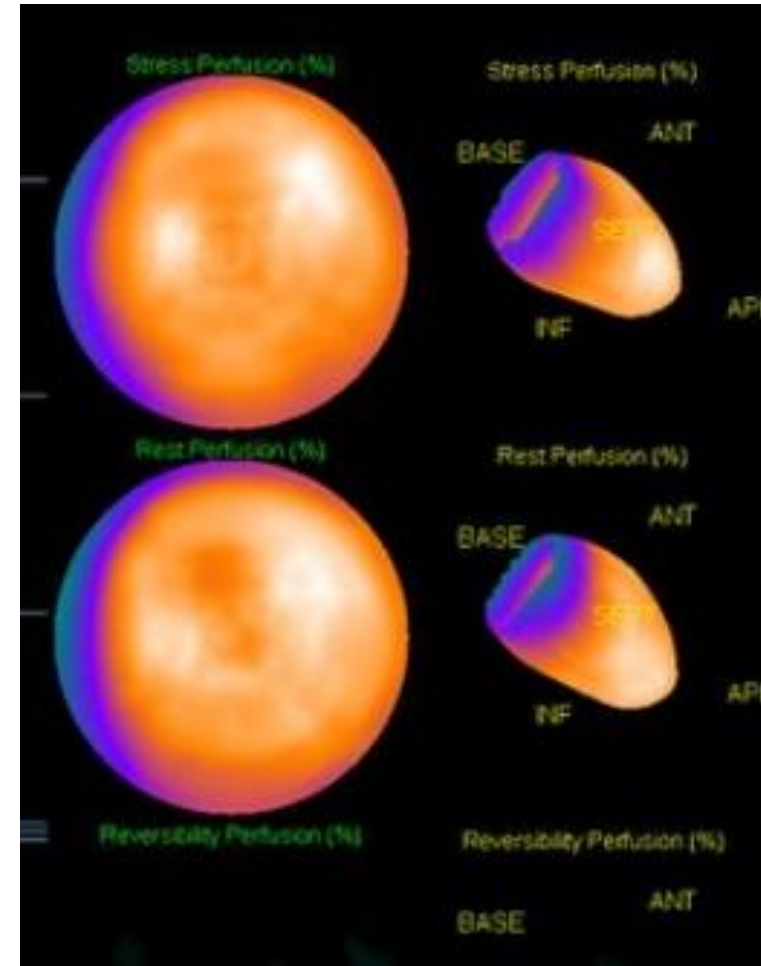
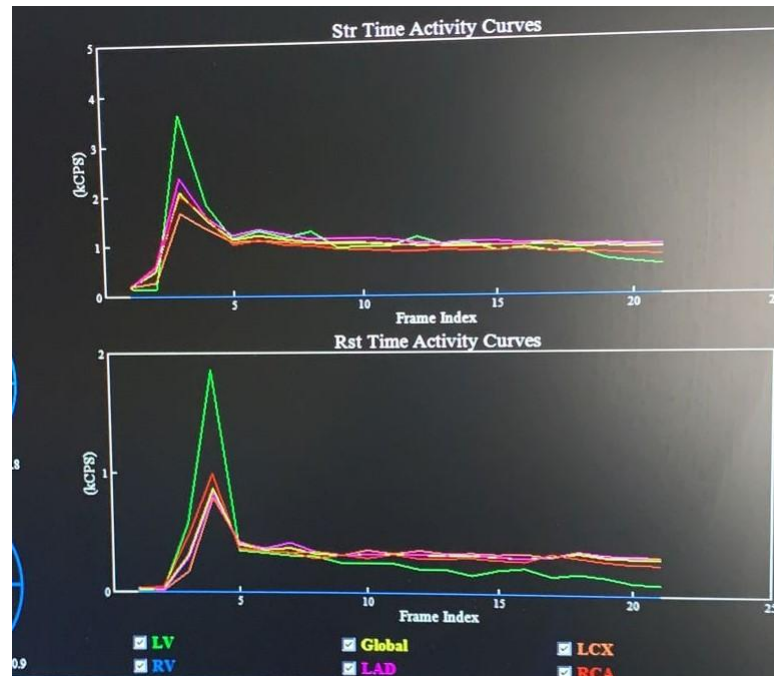


Figure 6 Kaplan–Meier survival analysis for patients with heart failure with preserved ejection fraction. The heart failure with preserved ejection fraction group ($n = 14$) was divided into two groups according to the median value of myocardial flow reserve (2.075): higher ($n = 7$) and lower ($n = 7$) groups. An event was defined as hospitalization due to heart failure or cardiovascular death. The dotted lines show 95% confidence intervals for each group. The log-rank (Mantel–Cox) test was applied to compare survival curves.

Em que situações a reserva de fluxo pode fazer a diferença?

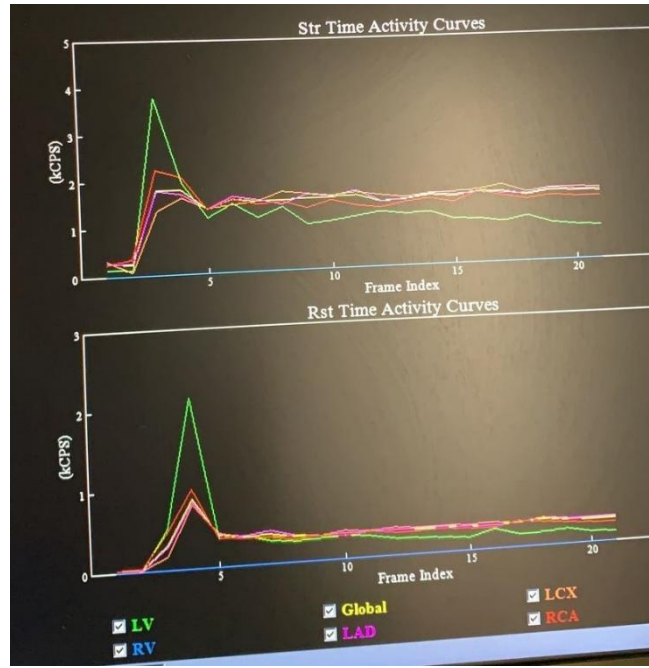
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Tem certeza que o dipiridamol funcionou?

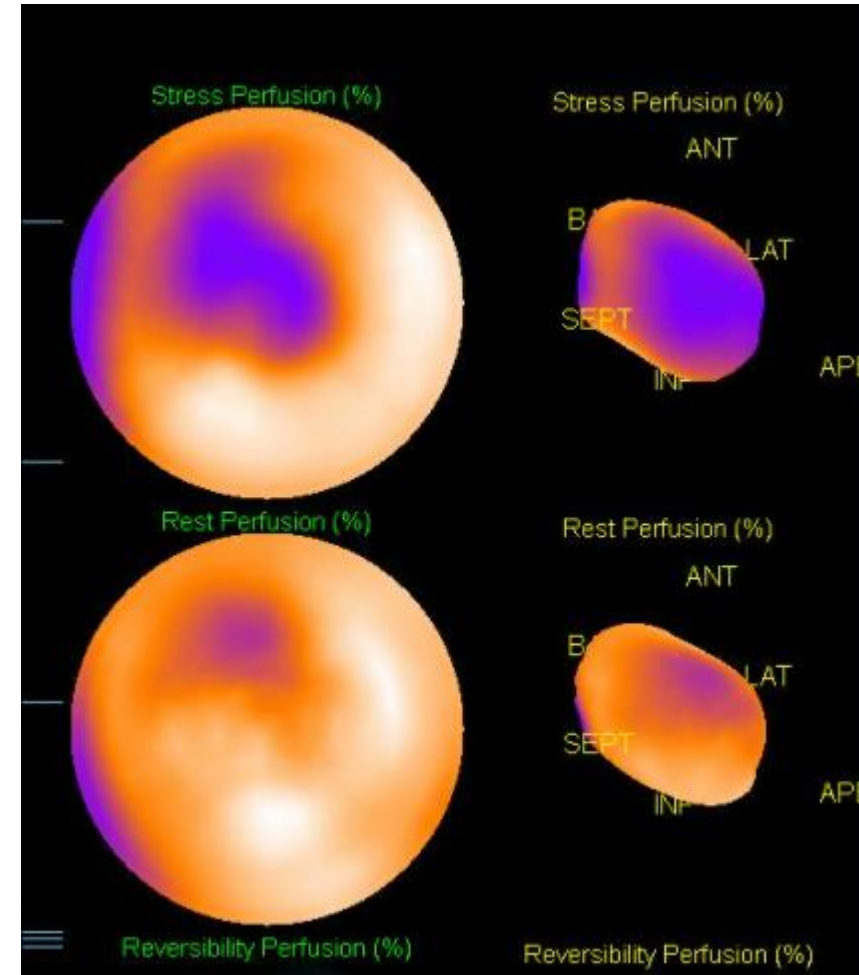


	Estresse	Repouso	Reserva
DA	1,01	0,86	1,18
CX	0,75	1,02	0,73
CD	0,90	0,99	0,90
TOTAL	0,87	0,96	0,92

Tem certeza que o dipiridamol funcionou (2)



	Estresse	Repouso	Reserva
DA	1,17	0,70	1,67
CX	2,68	0,84	3,18
CD	1,85	0,55	3,36
TOTAL	1,90	0,69	2,75



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