

MICROCIRCULACIÓN ¡QUÉ TONTERÍA!...O NO

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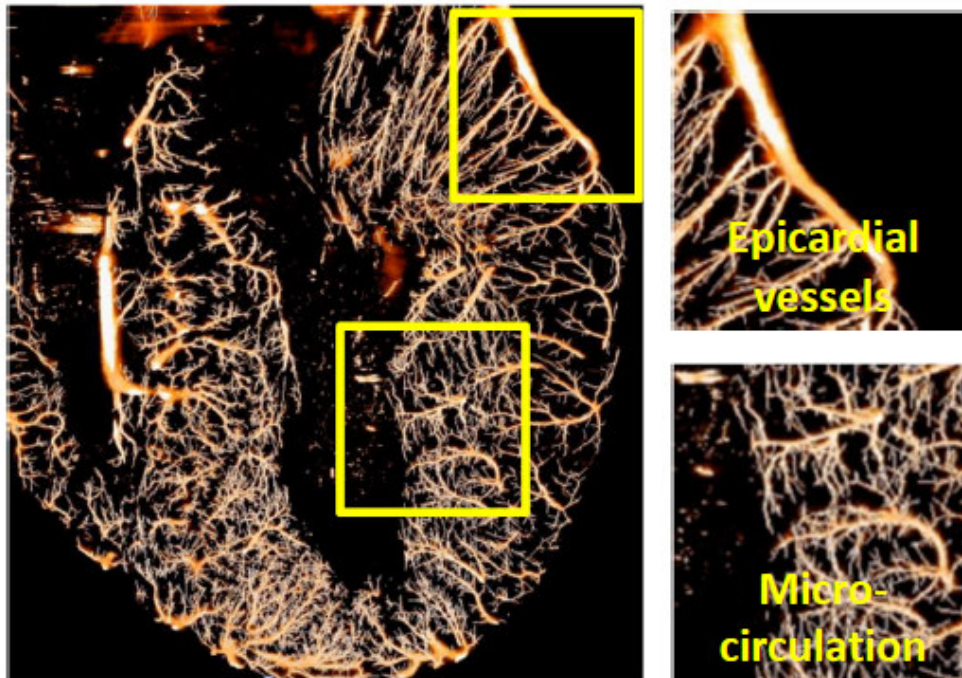
Visible en una angiografía:
mayor a 500 μm

Con el permiso de Prof. P. Camici



Invisible en una angiografía:
menor a 500 μm

Epicardial vessels and microcirculation in clinical practice



Investigated and treated
(stenosis only)

Largely ignored and
not treated

Cardiac Syndrome X: Clinical Characteristics and Left Ventricular Function

Long-Term Follow-Up Study

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Objectives. Our aim was to study the clinical characteristics and evolution of symptoms and left ventricular function in a clinically homogeneous group of patients with syndrome X (angina pectoris, positive exercise test results and normal coronary arteriograms).

Background. The syndrome of angina with normal coronary arteriograms is heterogeneous and encompasses different pathogenetic entities. These characteristics may contribute to the existing controversy concerning the cause of syndrome X.

Methods. We studied 99 patients with syndrome X (78 women, 21 men; mean age \pm SD 48.5 ± 8 years). All underwent clinical characterization, ambulatory electrocardiographic (ECG) monitoring and echocardiographic assessment of left ventricular function during a follow-up period of 7 ± 4 years.

Results. The syndrome was more common in women than men. Of the women, 61.5% were postmenopausal before the onset of chest pain. All 99 patients had exertional angina, and 41 had rest angina. The average duration of episodes of chest pain was >10 min in 53% of patients. Sublingual nitrate was effective for relief of pain in 42% of patients. Transient ST segment

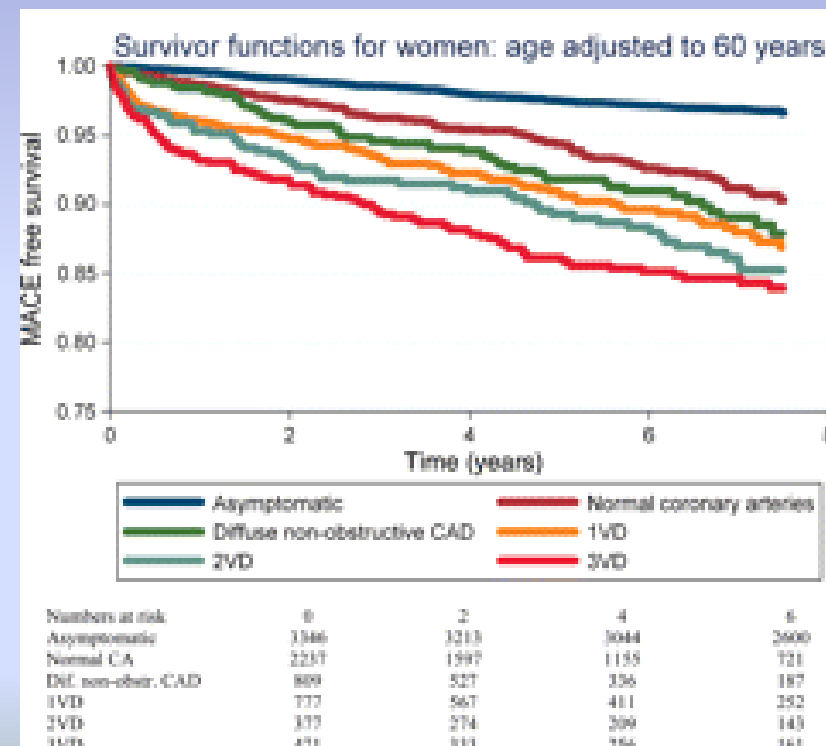
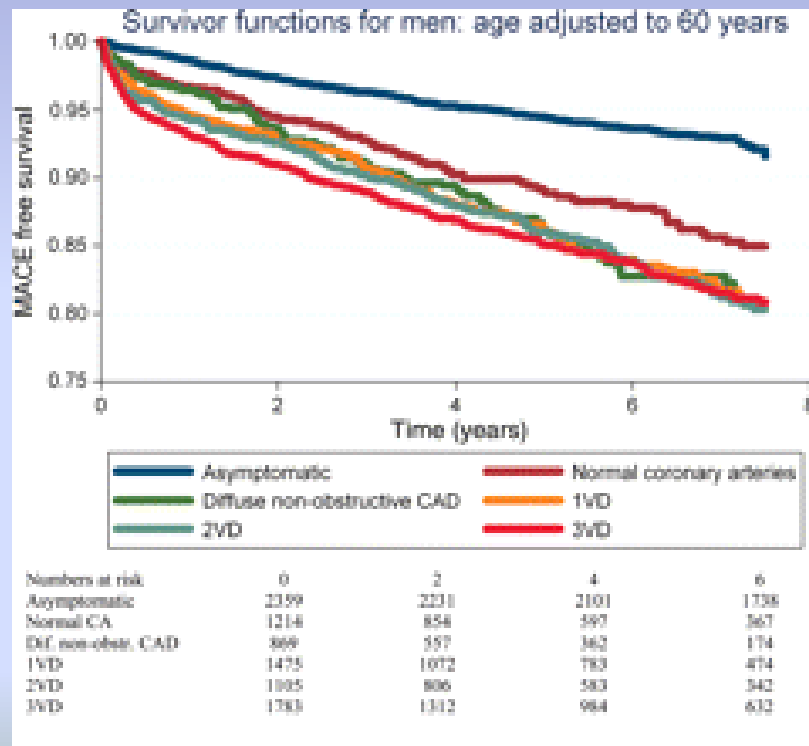
depression was observed during ambulatory ECG monitoring in 64 patients and myocardial perfusion abnormalities in 22. During the first stage of the exercise test, 37 patients had an increase

Conclusions. Syndrome X, as defined in this study, occurs predominantly in postmenopausal women. Patients usually have chest pain typical for angina, but conventional antianginal treatment is not often successful. Myocardial perfusion abnormalities occur in a small proportion of patients. Long-term survival is not adversely affected, and deterioration of cardiac function rarely occurs.

(J Am Coll Cardiol 1995;25:807-14)

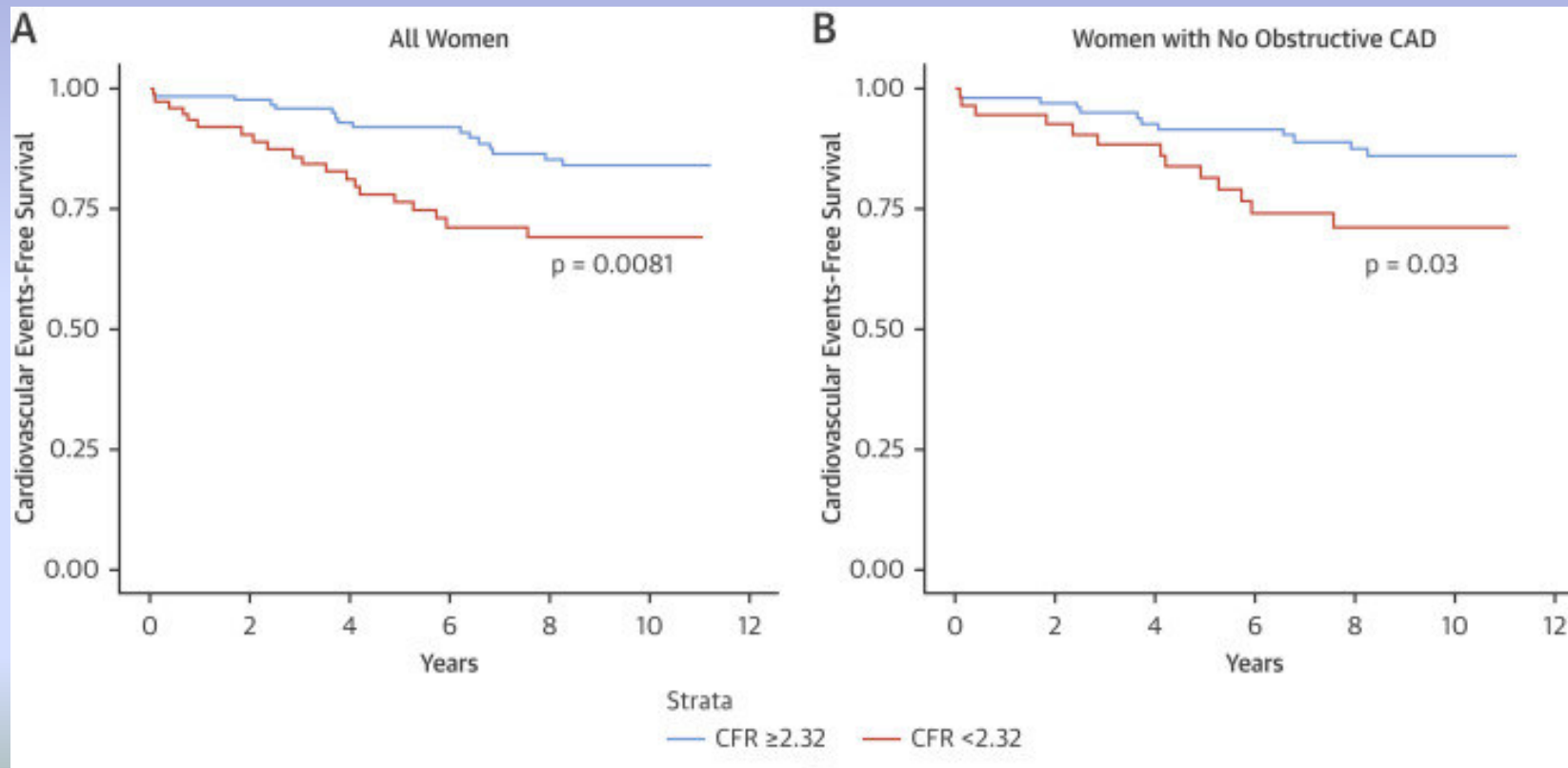
2012 Mar;33(6):734-44. doi: 10.1093/eurheartj/ehr331.

Stable angina pectoris with no obstructive coronary artery disease is associated with increased risks of major adverse cardiovascular events



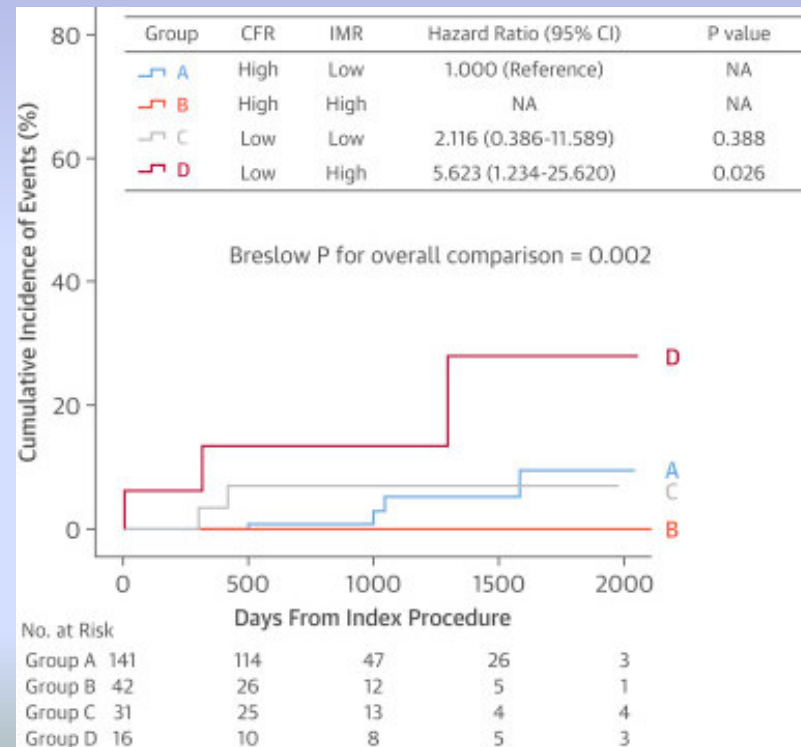
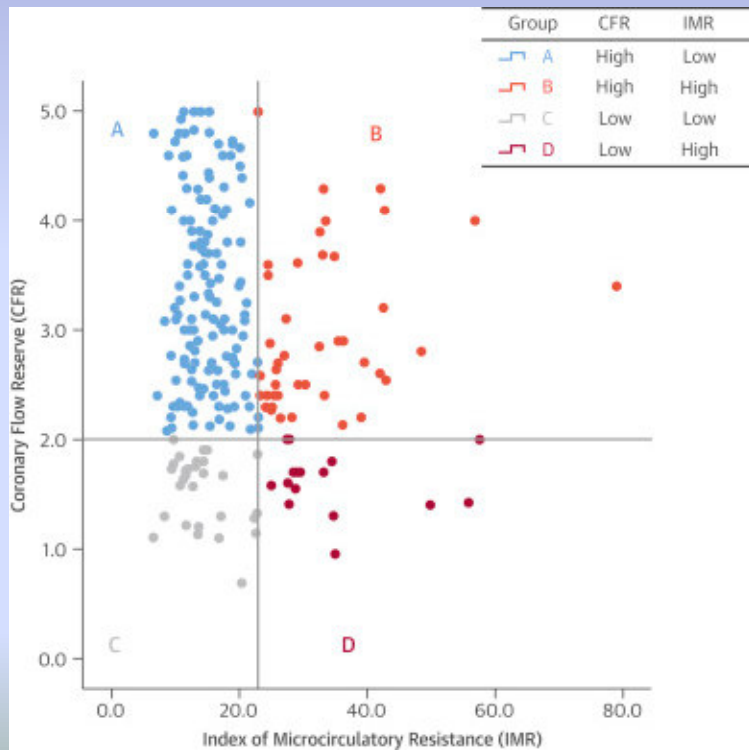
2019 Feb 19;73(6):684-693. doi: 10.1016/j.jacc.2018.11.040.

Impact of Abnormal Coronary Reactivity on Long-Term Clinical Outcomes in Women

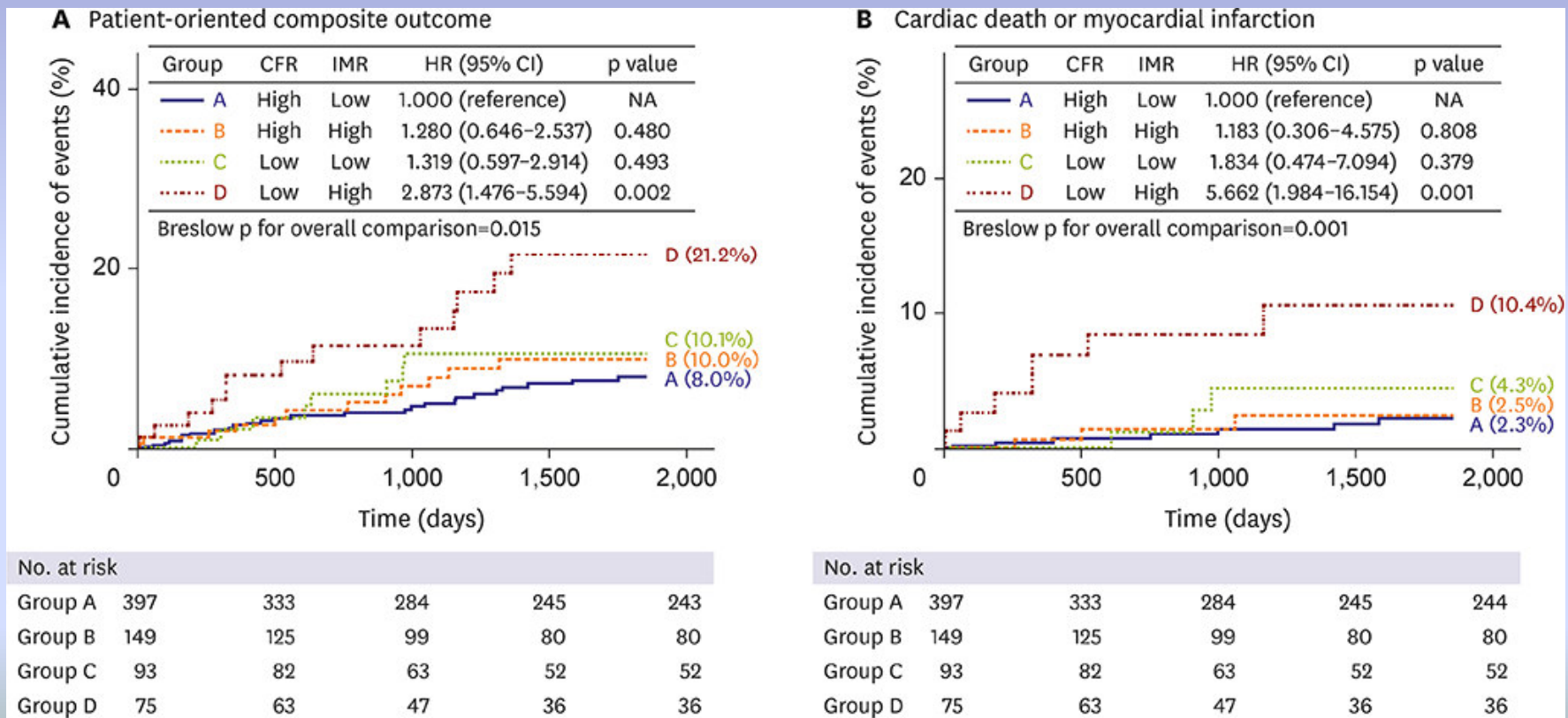


2016 Mar 15;67(10):1158-1169. doi: 10.1016/j.jacc.2015.12.053.

Coronary Flow Reserve and Microcirculatory Resistance in Patients With Intermediate Coronary Stenosis

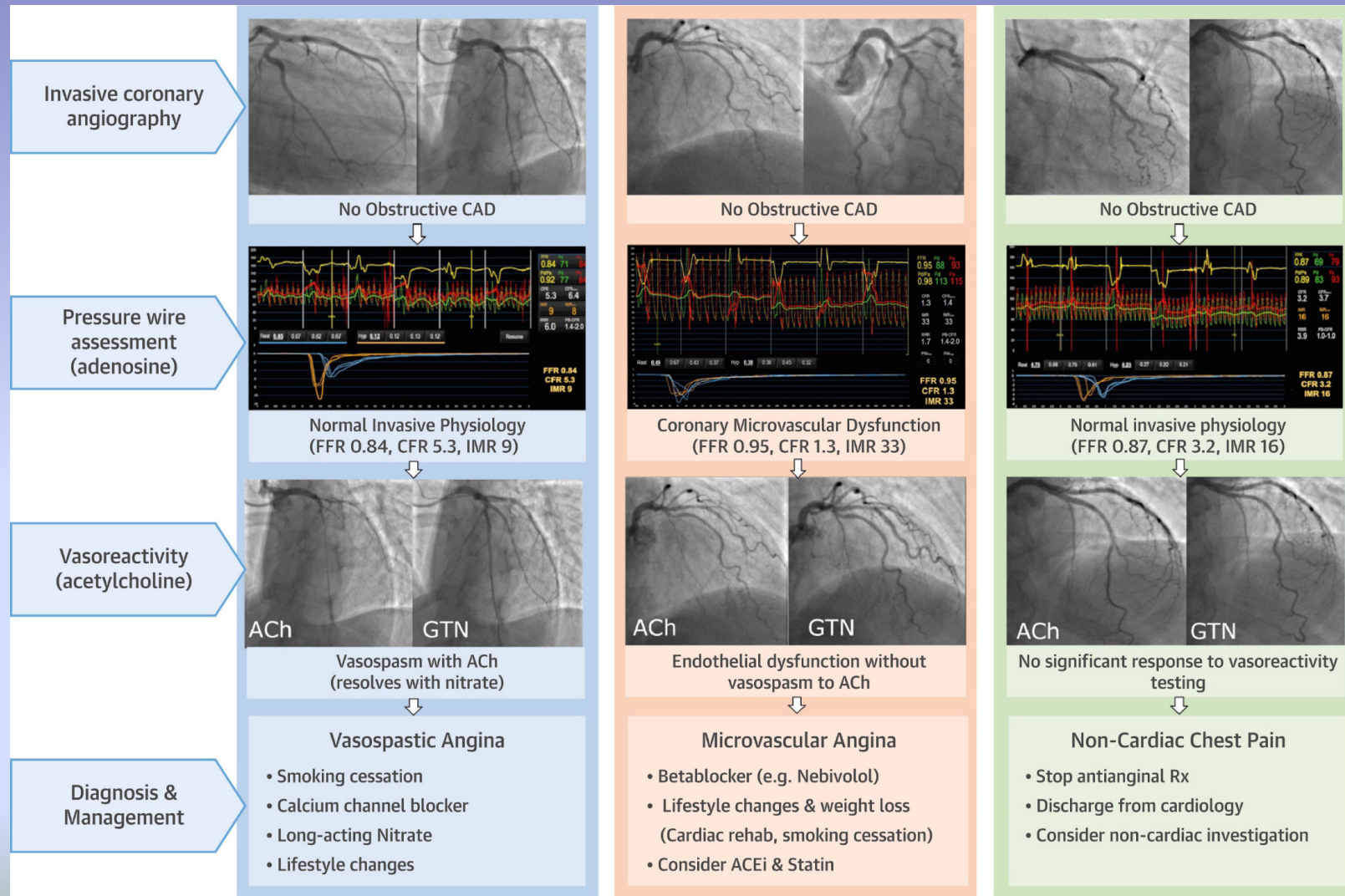


Long-term Patient Prognostication by Coronary Flow Reserve and Index of Microcirculatory Resistance: International Registry of Comprehensive Physiologic Assessment



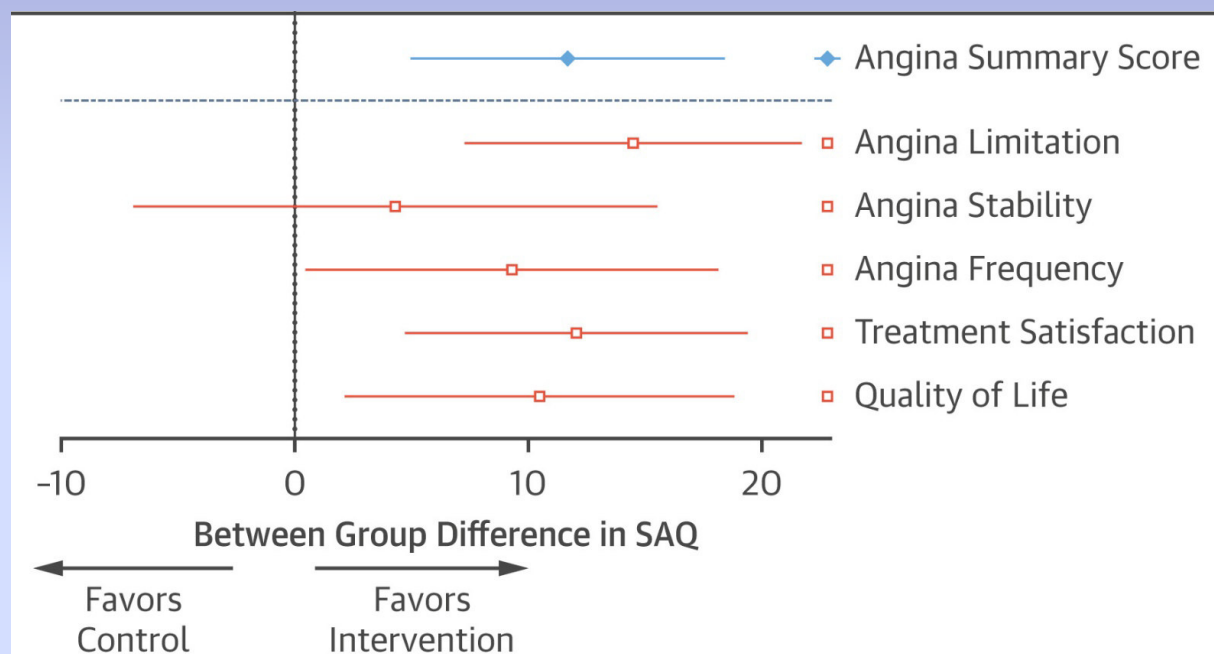
2018 Dec 11;72(23 Pt A):2841-2855. doi: 10.1016/j.jacc.2018.09.006. Epub 2018 Sep 25.

Stratified Medical Therapy Using Invasive Coronary Function Testing in Angina: The CorMicA Trial



2018 Dec 11;72(23 Pt A):2841-2855. doi: 10.1016/j.jacc.2018.09.006.
Epub 2018 Sep 25.

Stratified Medical Therapy Using Invasive Coronary Function Testing in Angina: The CorMicA Trial



2020 Jan 14;41(3):407-477. doi: 10.1093/eurheartj/ehz425.

2019 ESC Guidelines for the diagnosis and management of chronic coronary syndromes

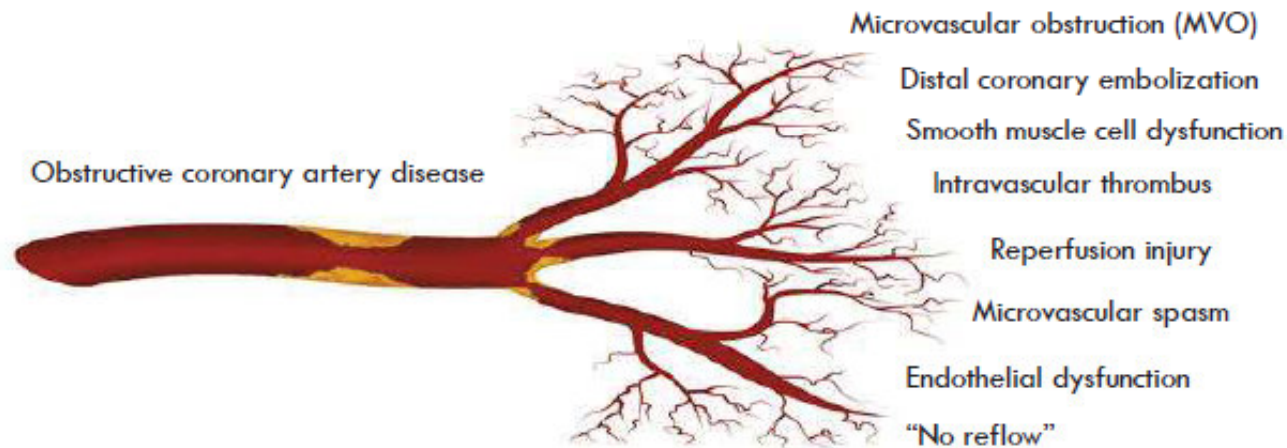
Recommendations	Class ^a	Level ^b
Guidewire-based CFR and/or microcirculatory resistance measurements should be considered in patients with persistent symptoms, but coronary arteries that are either angiographically normal or have moderate stenoses with preserved iwFR/FFR. ^{412,413}	IIa	B
Intracoronary acetylcholine with ECG monitoring may be considered during angiography, if coronary arteries are either angiographically normal or have moderate stenoses with preserved iwFR/FFR, to assess microvascular vasospasm. ^{412,438–440}	IIb	B

2019



MICROVASCULAR DYSFUNCTION

- Up to **50%** of patients with Angina have no obstructive coronary artery disease at angio¹
- Up to **30%** of patients continue to have angina after successful PCI²
- Microvascular dysfunction predicts adverse events



1. Patel MR, Peterson ED, Dai D et al. Low diagnostic yield of elective coronary angiography. *N Engl J Med* 2010;362:886-95.

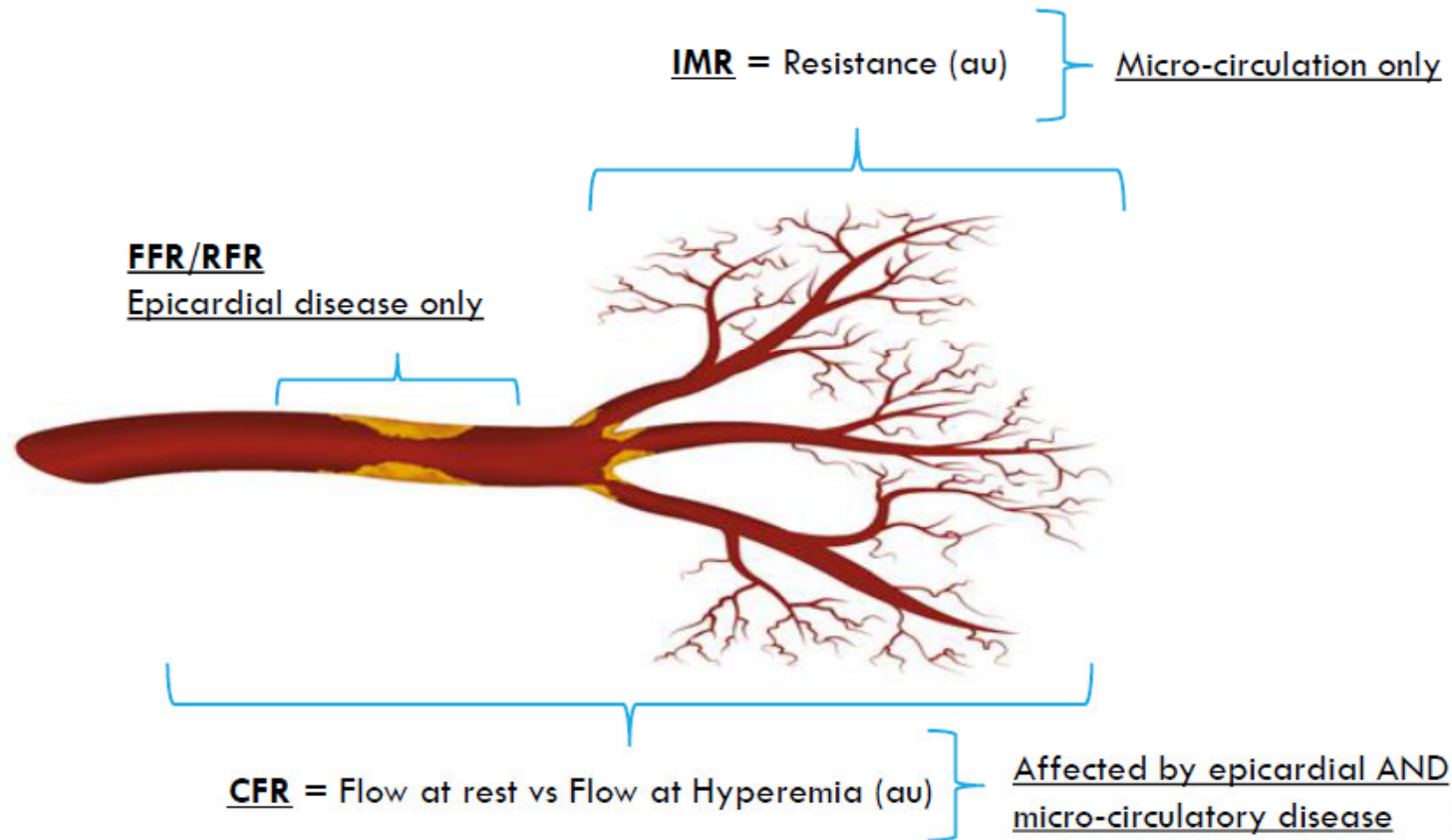
2. Arnold SV, Jang JS, Tang F, Graham G, Cohen DJ, Spartus JA. Prediction of residual angina after percutaneous coronary intervention. *Eur Heart J Qual Care Clin Outcomes*. 2015;1:23-



IMR/CFR WITH COROVENTIS COROFLOW

Coroventis
Turning ideas into reality

METHODS FOR ASSESSING CORONARY CIRCULATION



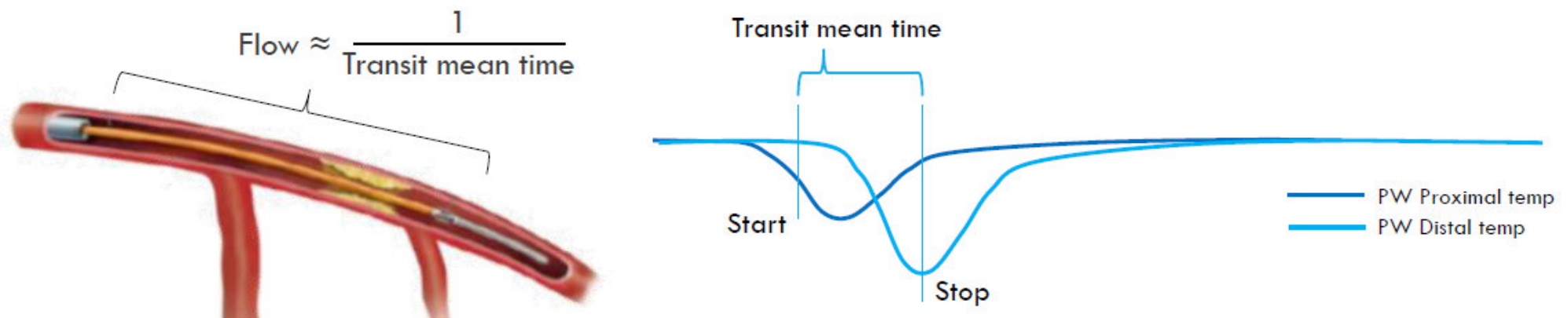
PRESSUREWIRE FLOW MEASUREMENT

- Abbott's PressureWire[®] X contains three sensors: one pressure and two temperature (proximal and distal)
- The temperature sensors can be used to measure flow via thermo-dilution



FLOW BY BOLUS THERMODILUTION

- Coronary blood flow is estimated inversely proportional to the time it takes for an injected bolus of room temperature saline to travel down the coronary artery
- By measuring the proximal and distal temperatures of the PressureWire the CoroFlow system can detect a bolus injection travelling down the artery and calculate the transit mean time: **T_{mn}**



Coronary Thermodilution to Assess Flow Reserve, Validation in Humans, Nico H.J. Pijls, Circulation. 2002;105:2482-2486

IMR Guide R01 Nov 2018

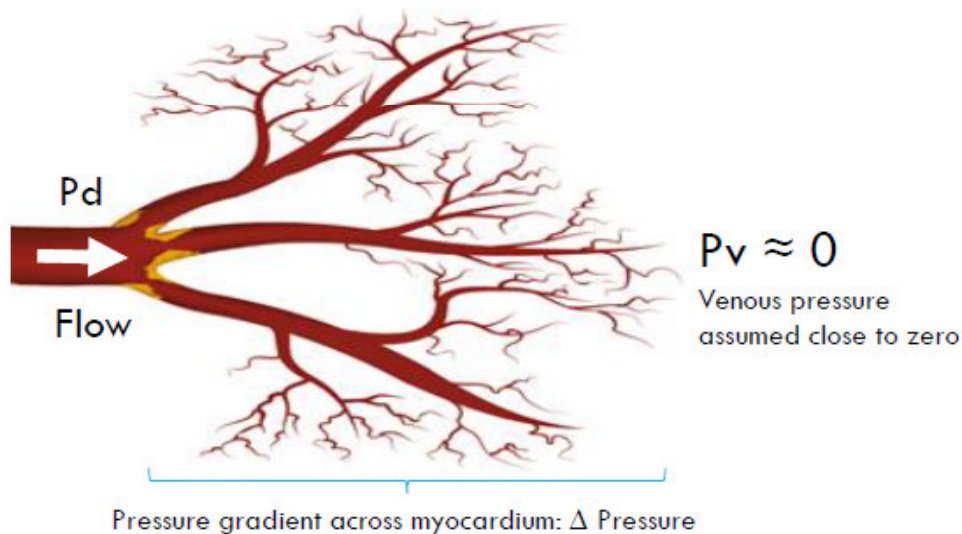
Caution: Always refer to CoroFlow IFU for safety and handling instructions

Coroventis
Turning ideas into reality

DERIVATION OF IMR

$$\text{IMR} = \frac{\Delta \text{ Pressure}}{\text{Flow}} = \frac{P_d - P_v}{1/T_{mn}} \approx P_d \times T_{mn}$$

(Index of microcirculatory resistance) (at max hyperemia)



Index of Microcirculatory Resistance
Resistance at max hyperemia

$$\text{IMR} = P_d \times T_{mn}$$

Normal value ≤ 25

Resistive Reserve Ratio
Resistance change from Rest to Hyperemia

$$\text{RRR} = \frac{\text{IMR}_{\text{Rest}}}{\text{IMR}_{\text{Hyp}}}$$

Novel index for invasively assessing the coronary microcirculation. Fearon et al. Circulation. 2003;107:3129-3132

IMR Guide R01 Nov 2018

Caution: Always refer to CoroFlow IFU for safety and handling instructions

Coroventis
Turning ideas into reality

DERIVATION OF CFR

$$\text{CFR} = \frac{\text{Hyperemic flow}}{\text{Resting Flow}} = \frac{1/\text{Tmn_Hyp}}{1/\text{Tmn_Rest}} = \frac{\text{Tmn_Rest}}{\text{Tmn_Hyp}}$$

(Coronary Flow Reserve)



Coronary Flow Reserve
Flow change from rest to hyperemia

$$\text{CFR} = \frac{\text{Tmn_Rest}}{\text{Tmn_Hyp}}$$

Normal value: >2

PRESSUREWIRE™ X GUIDEWIRE

Helps to diagnose the severity and nature of coronary artery disease.



≤ 0.80



≤ 0.89



≤ 2.0



≥ 25

CONCLUSIONES

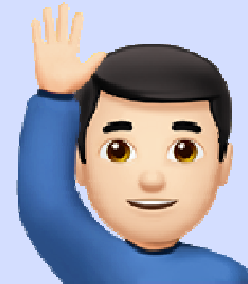
- La microcirculación **NO** es una tontería
- Ya sabemos que no es esto



- Podemos diagnosticar mejor
- Podemos orientar tratamiento
- Podemos identificar pacientes alto riesgo
- Procedimiento sencillo

CONCLUSIONES

- Dolor anginoso persistente
- Mejor si test de isquemia positivo
- Coronarias epicárdicas sin lesiones significativas



Dr. Valencia

