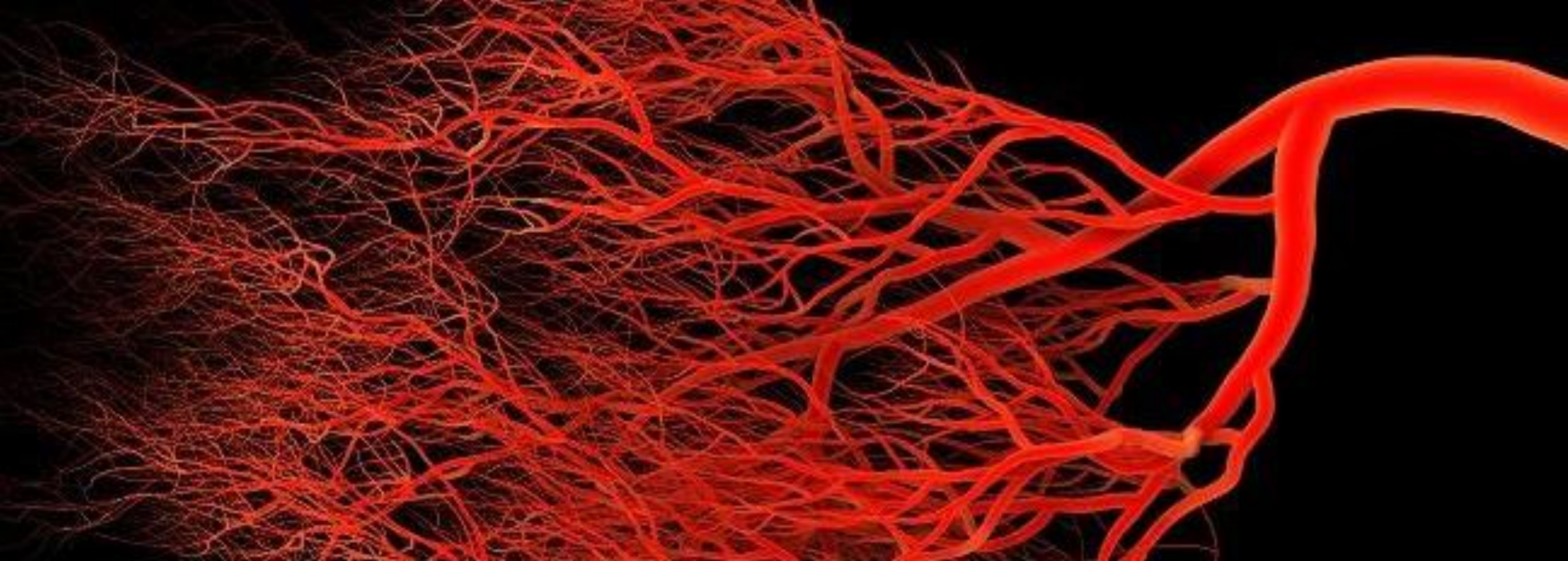




CORONARY MICROVASCULAR DISEASE & DIABETES MELLITUS

Assessment of microvascular fx and angina



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**National and Kapodistrian
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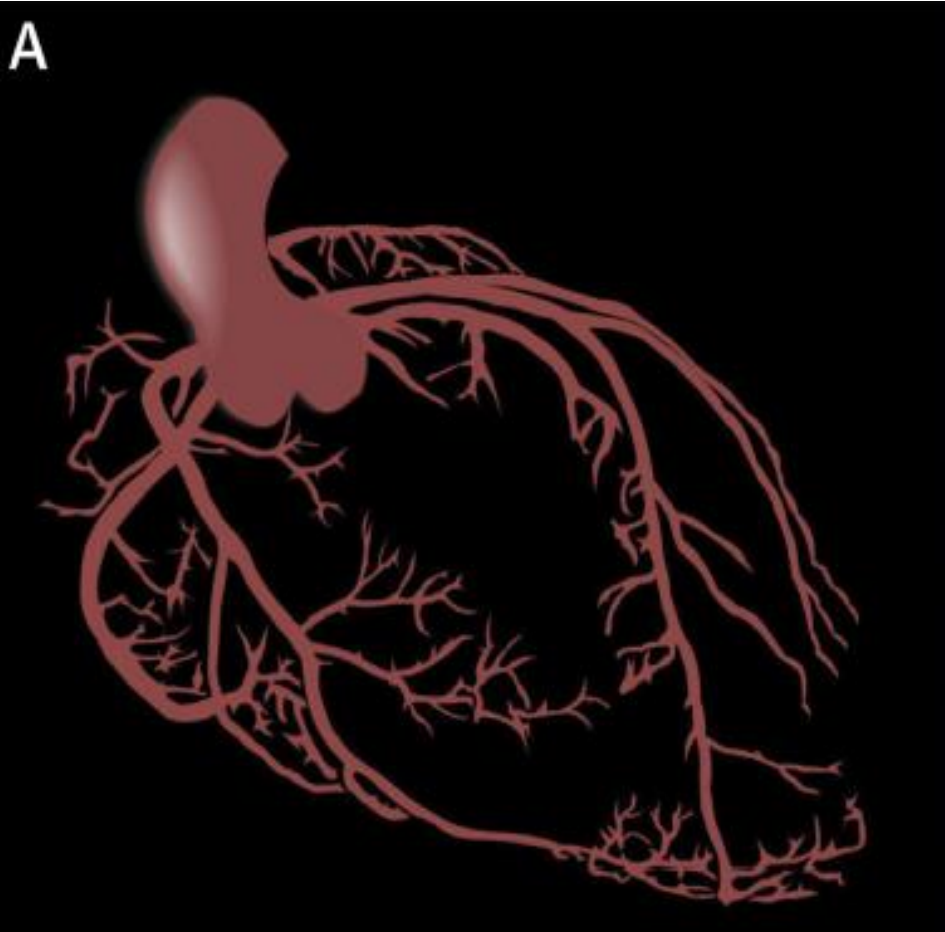
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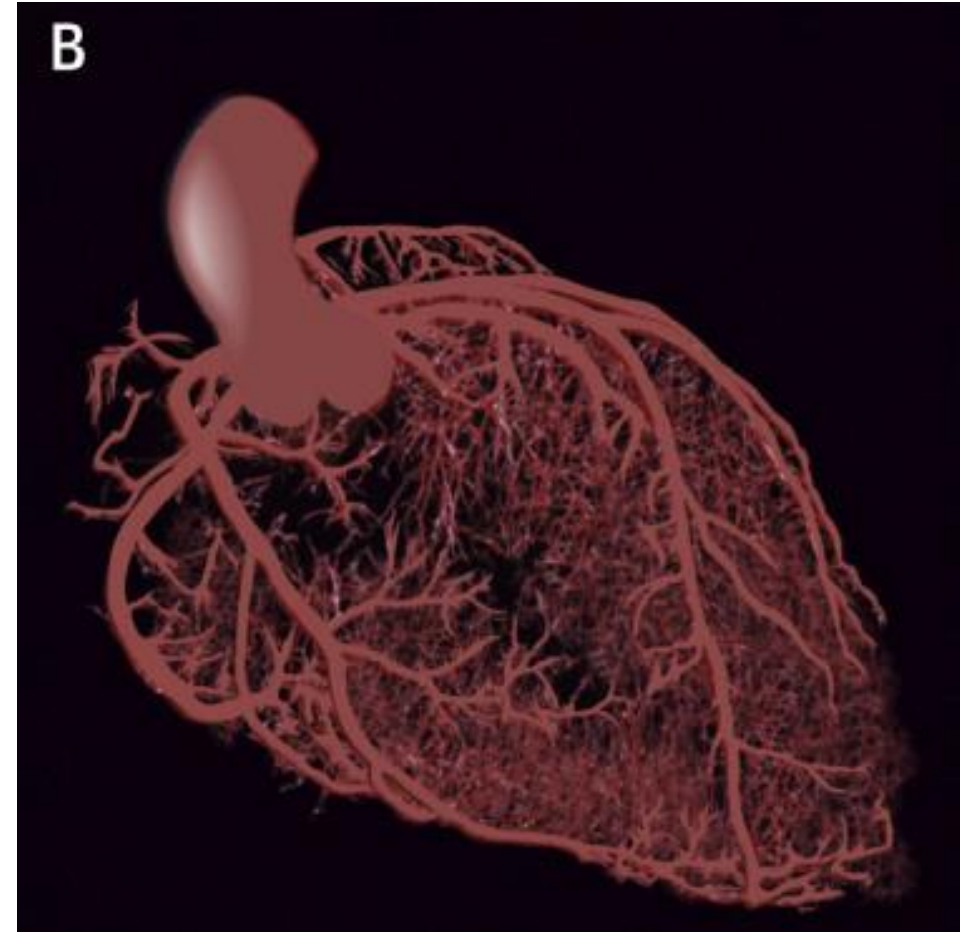
Coronary macro- and microcirculation

Schematic illustration

Macrocirculation



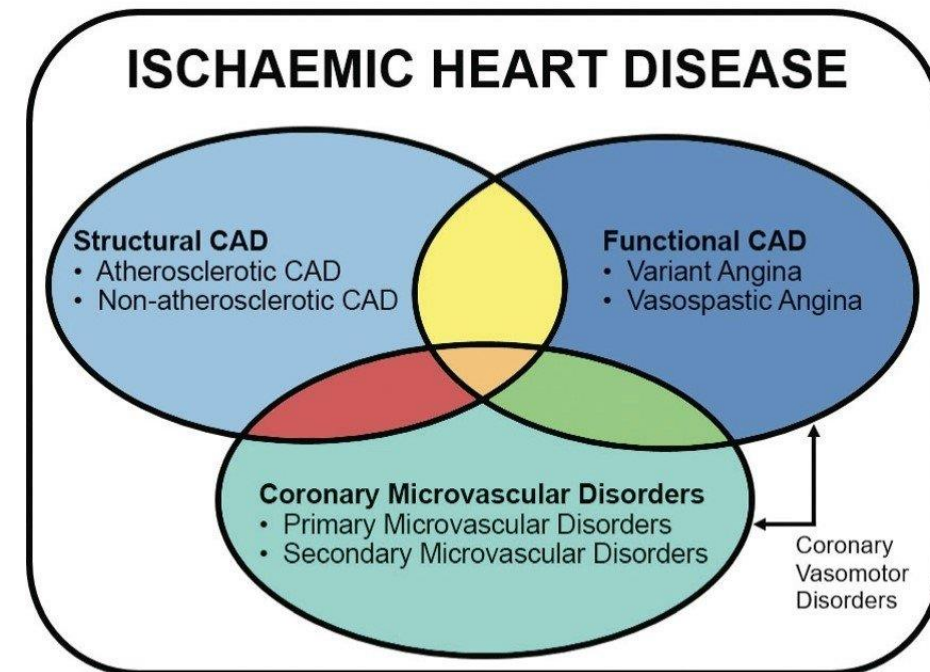
Macro- & Microcirculation



Ischemic Heart Disease

Epidemiology

- Angina pectoris, the most common symptom of ischemic heart disease (IHD), affects approximately 112 million people globally.¹
- A large proportion of patients (up to 50-70%) undergoing coronary angiography because of angina and evidence of myocardial ischemia do not have obstructive coronary arteries (INOCA).^{2,3}
- Coronary microvascular dysfunction is present in a large proportion of patients with non-obstructive CAD (~30–50%) even after exclusion of epicardial spasm using provocative testing with acetylcholine.^{4,5}



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¹ GBD 2015. Lancet 2016; 388:1459-544

² Knuuti J et al. EHJ 2020; 41:407-77

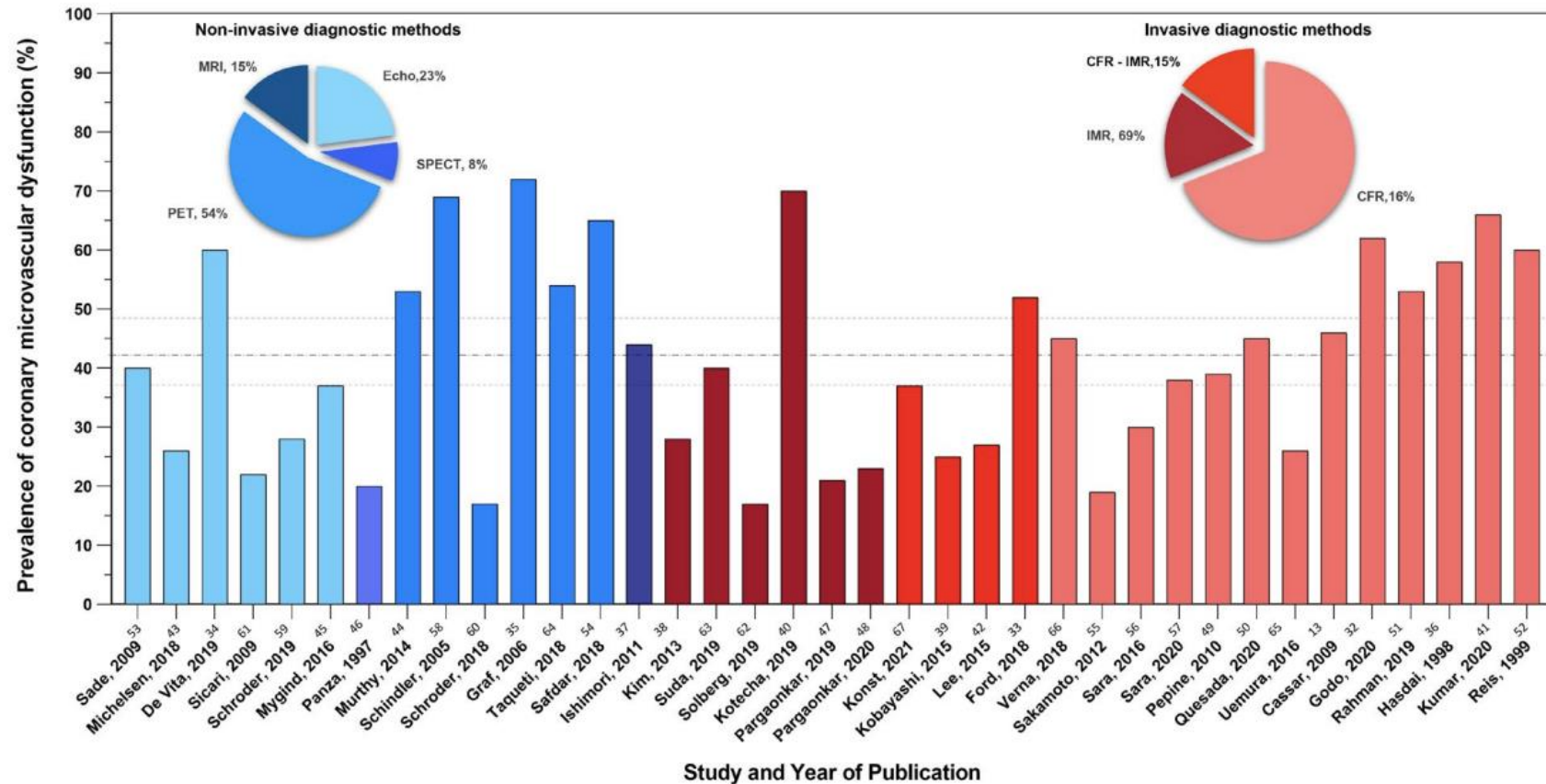
³ Reeh J et al. EHJ 2019; 40:1426-35

⁴ Reis SE et al. AHJ 2001; 141:735-41

⁵ Ong P et al. JACC 2012; 59:655-62

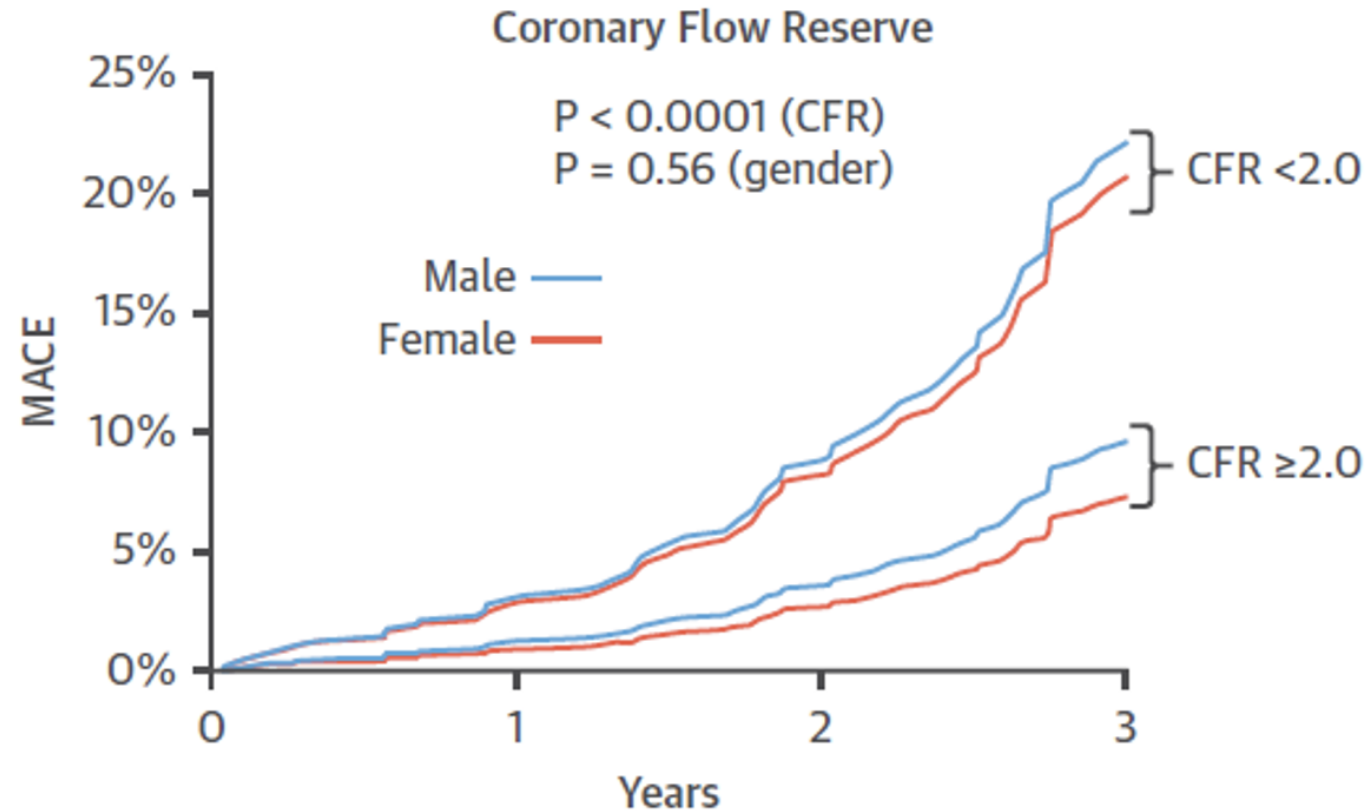
Prevalence of Coronary Microvascular Disease in DM

Assessed by invasive (red) and noninvasive (blue) methods
Meta-analysis, Fifty-six studies comprising 14 427 patients



Prognosis of microvascular dysfunction

Prospective observational, at-risk individuals w/o CAD, n=1217, mean FU 1.3 yrs, MACE: cardiac death, nonfatal myocardial infarction, late revascularization, and hospitalization for heart failure



Clinical criteria for suspected microvascular angina

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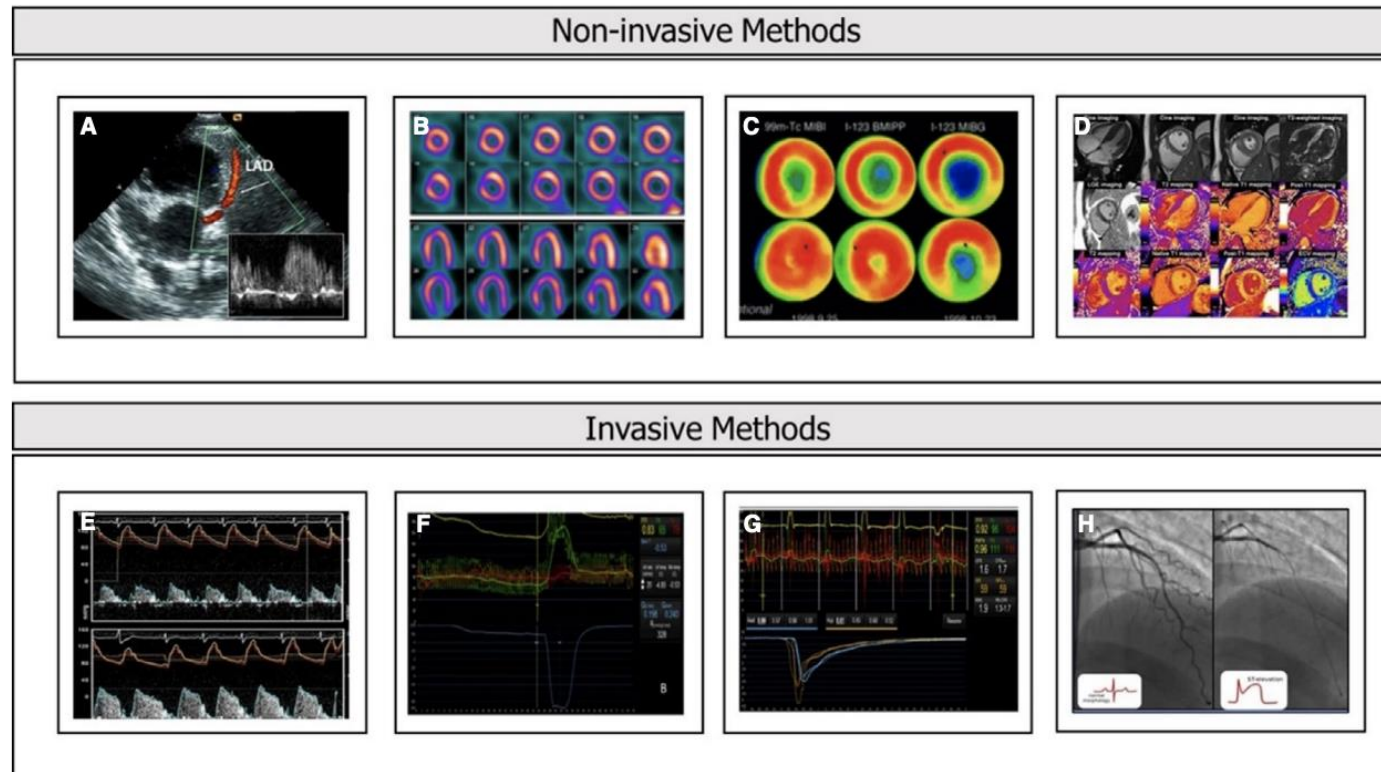
1. Symptoms of myocardial ischemia
 - a. Effort and/or rest angina
 - b. Angina equivalents (i.e. shortness of breath)
2. Absence of obstructive CAD (<50% diameter reduction or FFR > 0.80) by
 - a. Coronary CTA
 - b. Invasive coronary angiography
3. Objective evidence of myocardial ischemia
 - a. Ischemic ECG changes during an episode of chest pain
 - b. Stress-induced chest pain and/or ischemic ECG changes in the presence or absence of transient/reversible abnormal myocardial perfusion and/or wall motion abnormality
4. Evidence of impaired coronary microvascular function
 - a. Impaired coronary flow reserve (cut-off values depending on methodology use between ≤ 2.0 and ≤ 2.5)
 - b. Coronary microvascular spasm, defined as reproduction of symptoms, ischemic ECG shifts but no epicardial spasm during acetylcholine testing.
 - c. Abnormal coronary microvascular resistance indices (e.g. IMR > 25)
 - d. Coronary slow flow phenomenon, defined as TIMI frame count >25.

Table legend: ECG = electrocardiogram, CAD = coronary artery disease, CTA = computed tomographic angiography, FFR = fractional flow reserve, IMR = index of microcirculatory resistance, TIMI = thrombolysis in myocardial infarction.

***Definitive MVA** is only diagnosed if all four criteria are present for a diagnosis of microvascular angina.

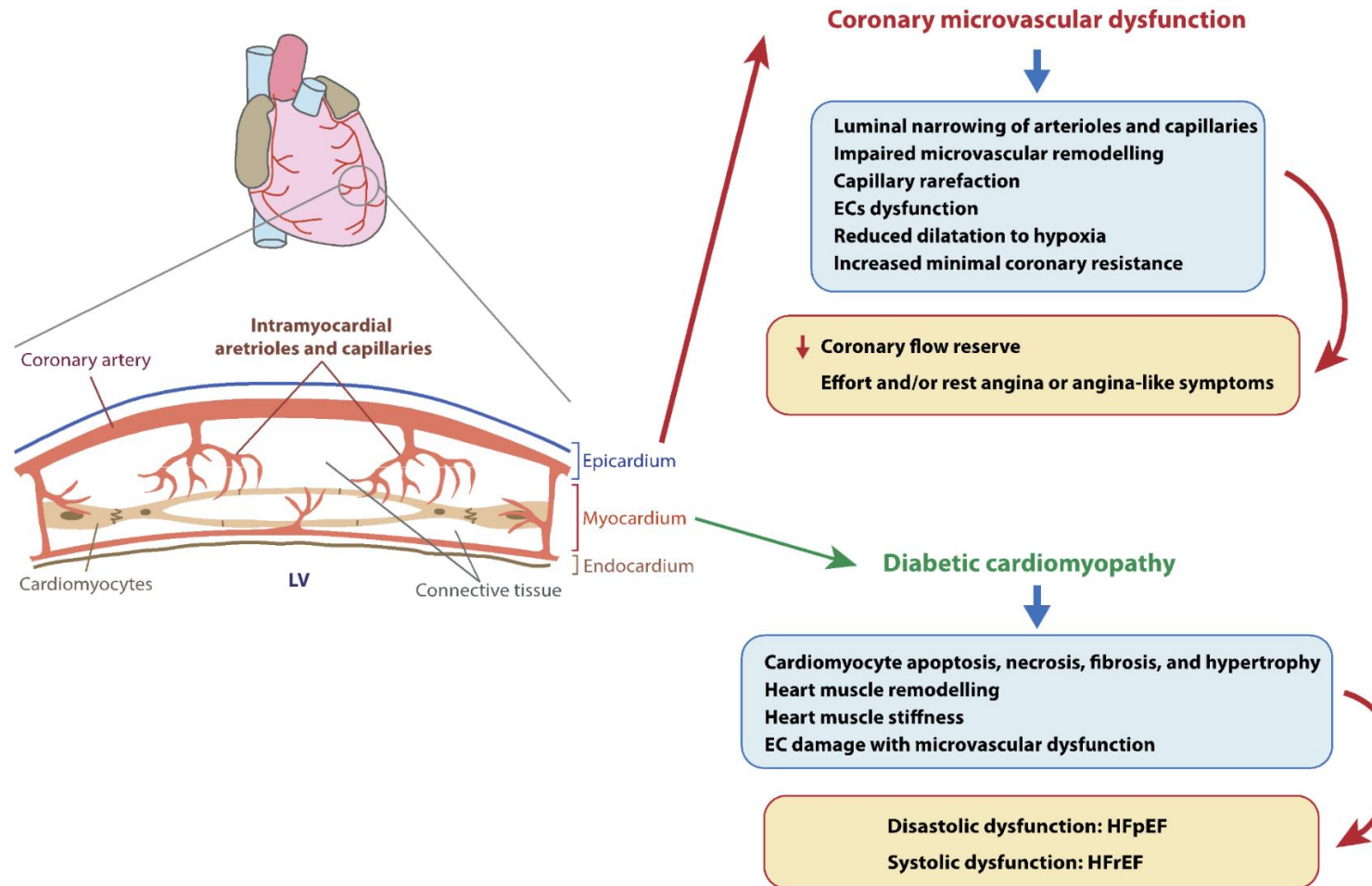
Suspected MVA is diagnosed if symptoms of ischemia are present (criteria-1) with no obstructive coronary artery disease (criteria-2) but only (a) objective evidence of myocardial ischemia (criteria-3), or (b) evidence of impaired coronary microvascular function (criteria-4) alone.

Methods used for evaluation of microvascular disease



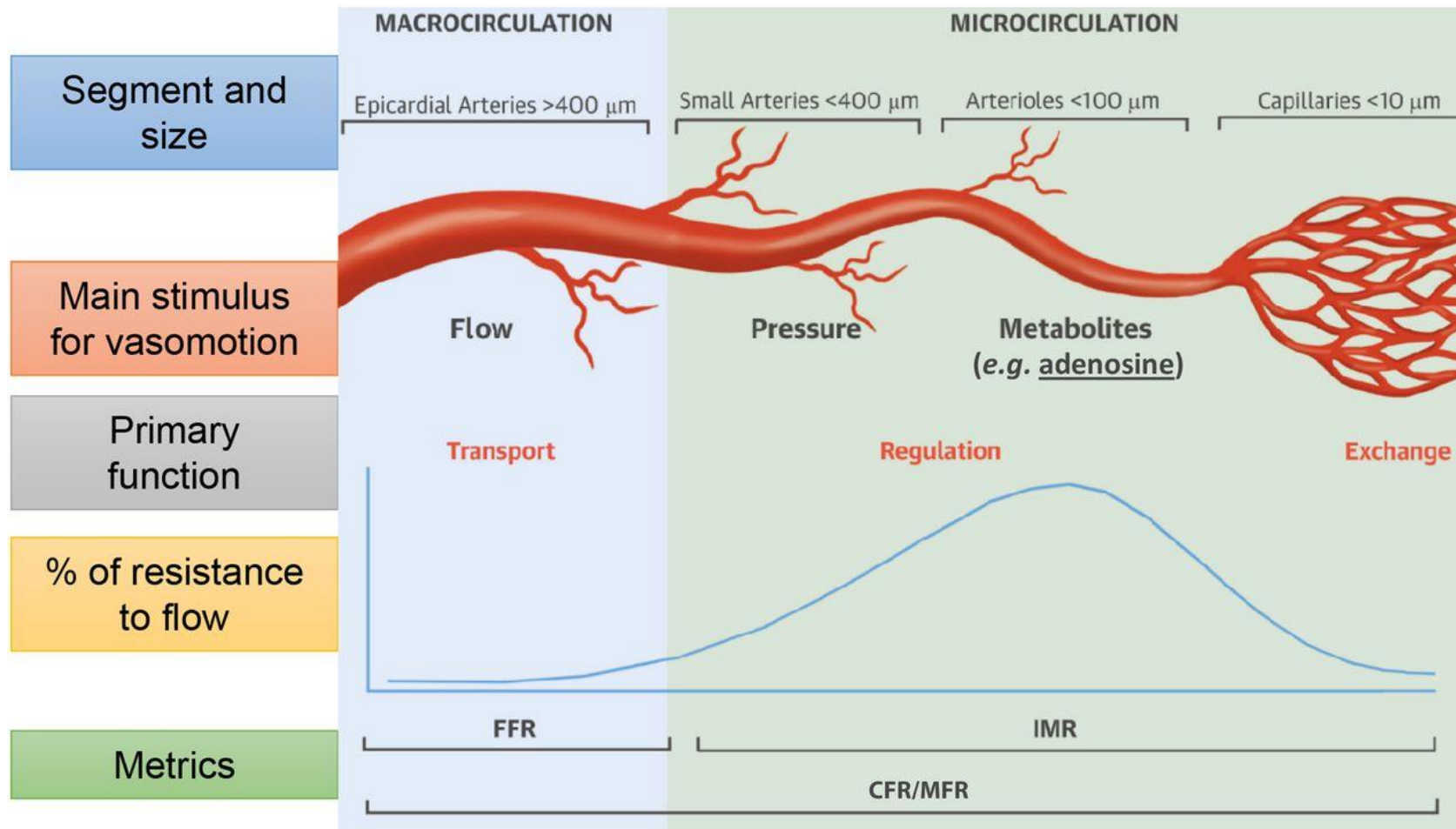
Pathophysiology of diabetic microvascular disease

Schematic mechanism



Pathophysiology of diabetic microvascular dysfunction

Schematic mechanism



FFR fractional flow reserve – obstructive epicardial disease (≤ 0.80)

IMR index of microcirculatory resistance – microvascular dysfunction ($\text{IMR} \geq 25$)

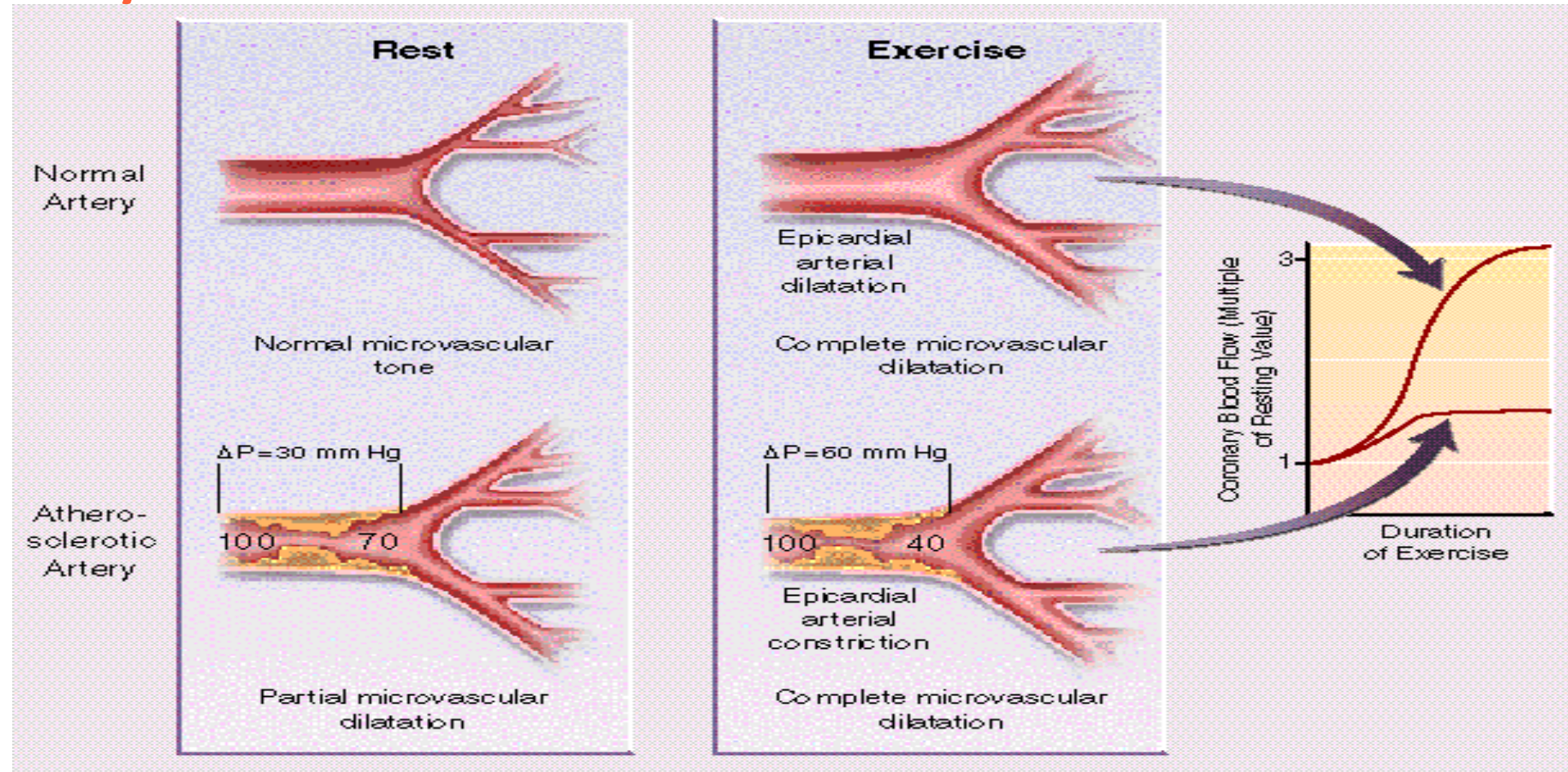
CFR coronary flow reserve – vasodilatory capacity ($\text{CFR} < 2.0$)

Coronary autoregulation

Concept of coronary flow reserve

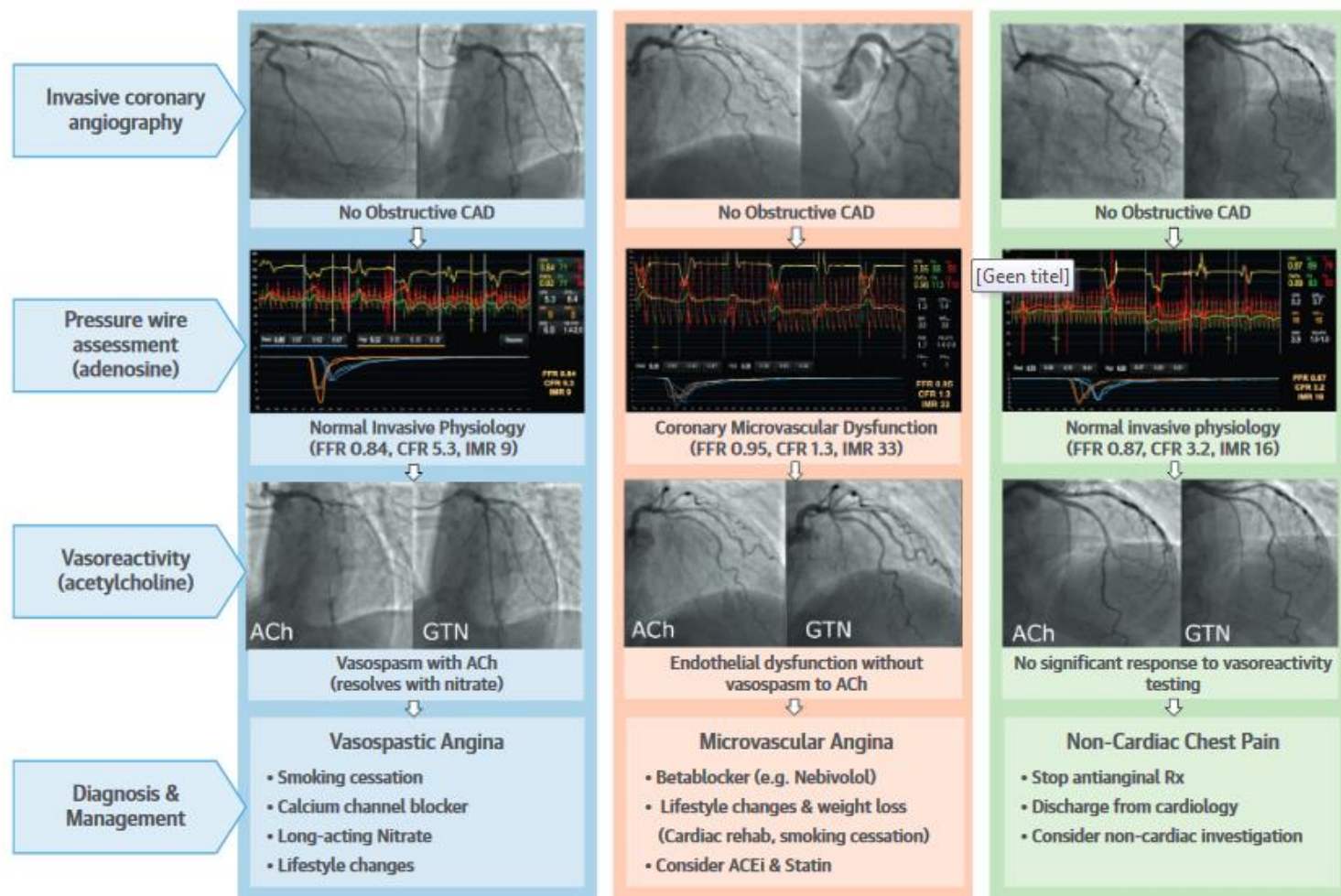
Normal:
CFR >3-5

Pathologic:
CFR <2.0



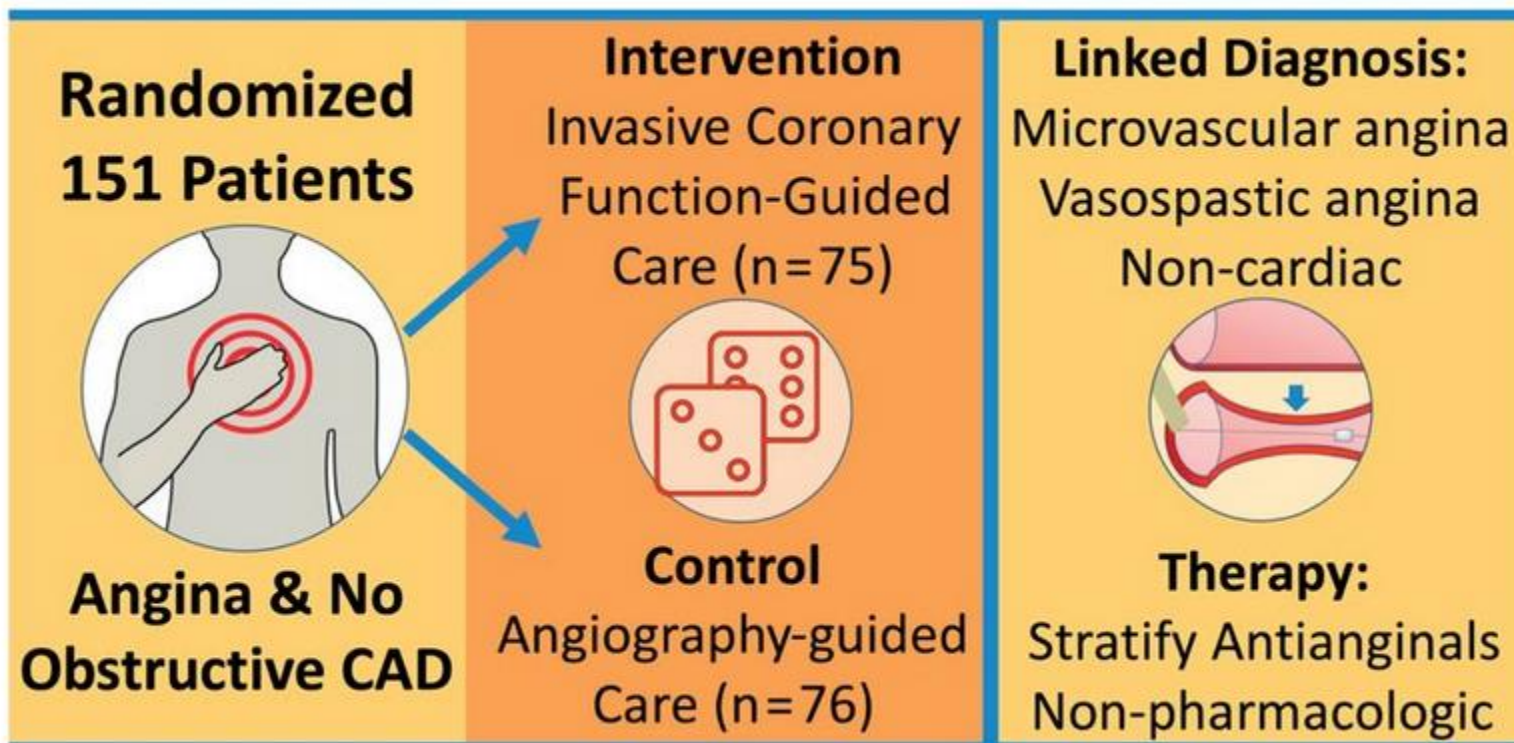
Invasive Coronary Function Testing in Angina

The CorMICA trial – Concept of Stratification

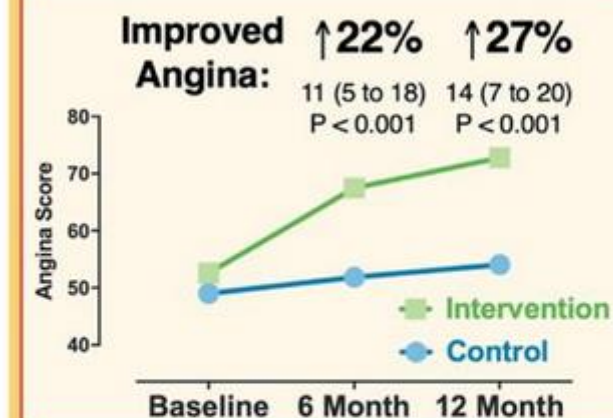


Management of Coronary Microvascular Disease

The CorMICA trial – 1 yr outcomes



Main Results:



Sustained Benefits:
Improved Angina and
Quality of Life

Summary

Coronary microvascular function has a high prevalence in diabetic patients.

MVD can be assessed by invasive using intracoronary measures and non-invasive diagnostic modalities such as IMR, PET and CMR.

Microvascular angina is real and measurable; Need for greater awareness among physicians for proper diagnosis and patient-tailored management.

MVD carries prognostic significance, since these patients have a significant poorer clinical outcome, with increased rates of death, MI, stroke and heart failure.

Early diagnosis and targeted medical therapy guided by invasive coronary function testing can improve symptoms, quality of life and blood flow (CFR)

Thank you for your attention

