

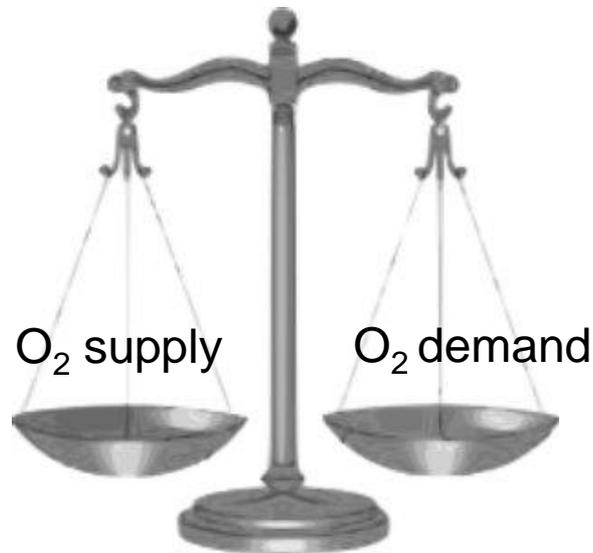
Ischemic heart disease

- pathogenesis, clinical features, primary & secondary prevention

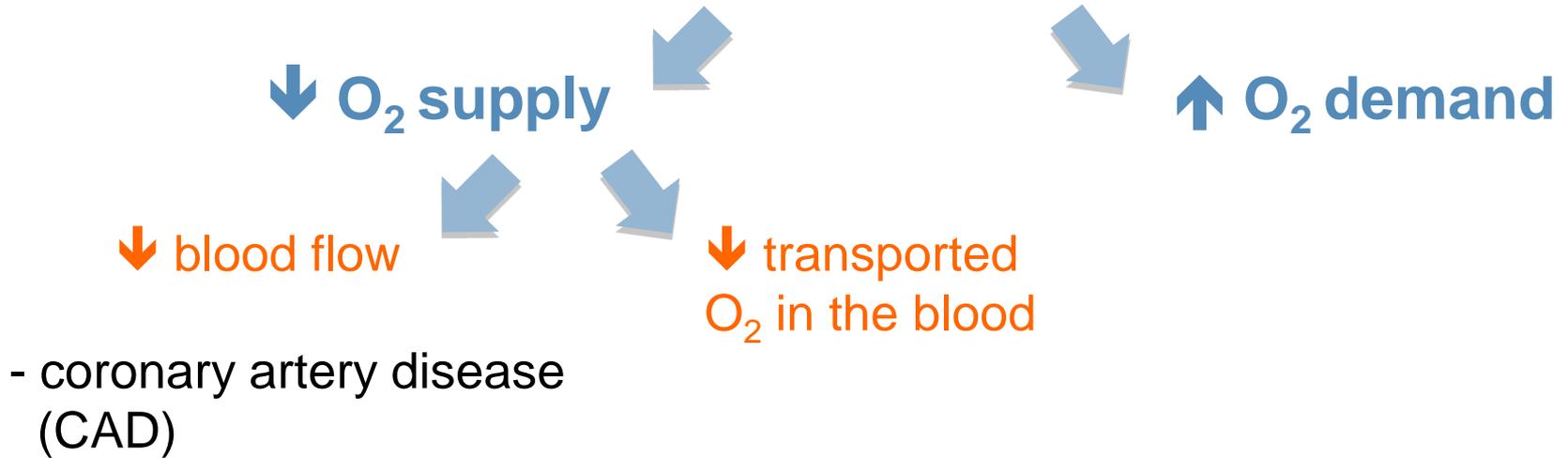
Agnieszka Kapłon-Cieślicka

Definition

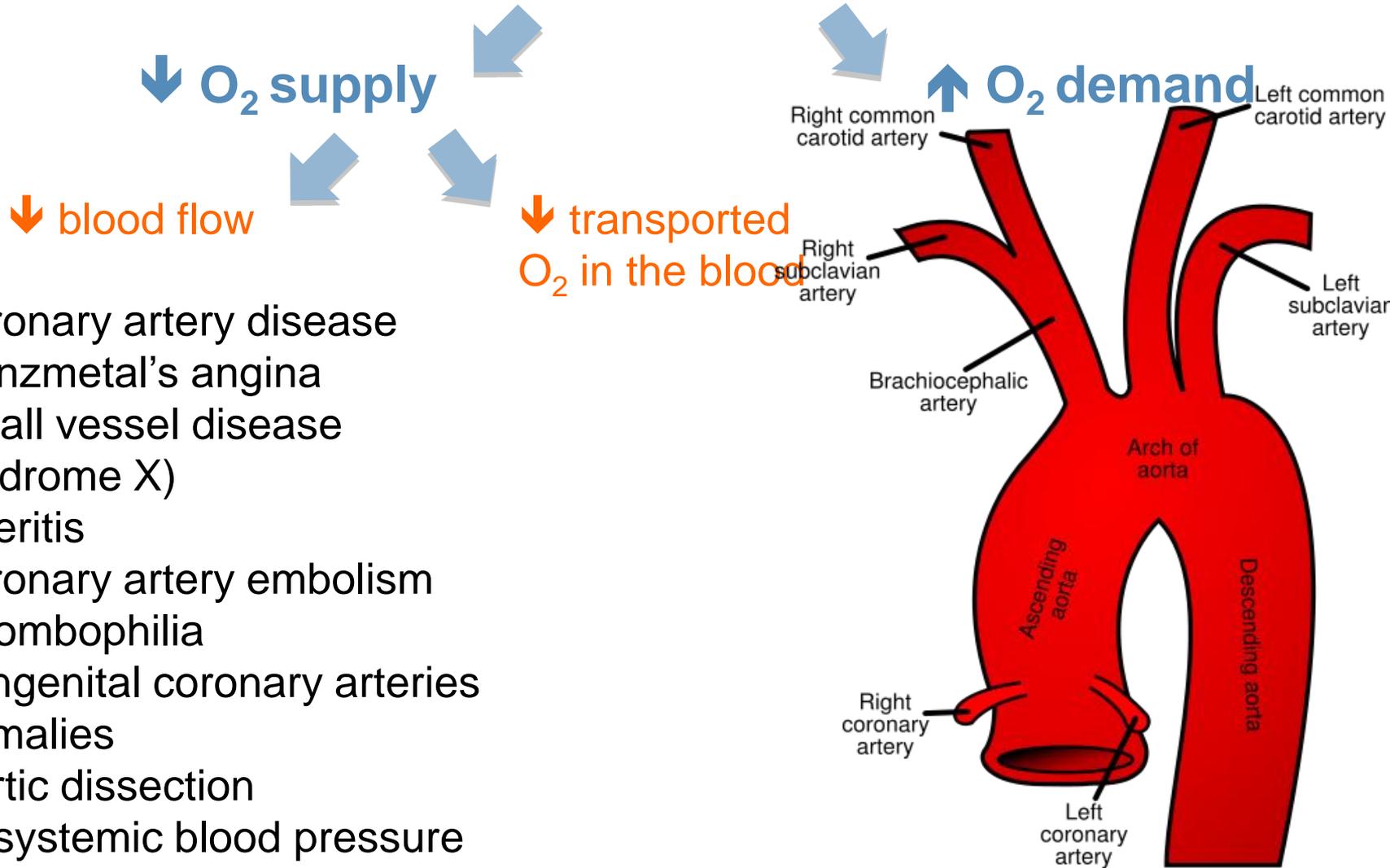
- Ischemic heart disease is ...
a complex of clinical symptoms of different pathogenesis,
caused by **insufficient oxygen supply**,
in comparison with actual **myocardial demands**



Ischemic heart disease - etiology

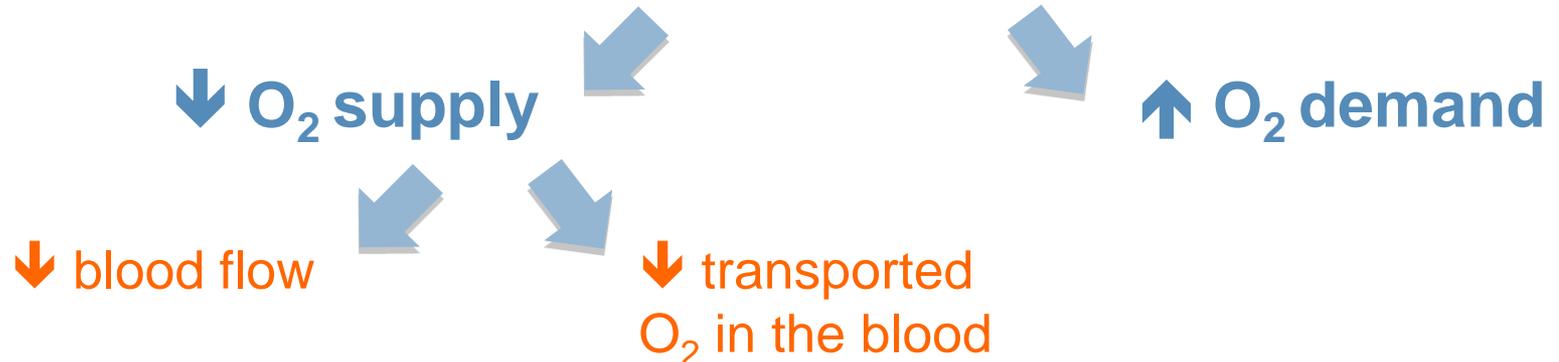


Ischemic heart disease - etiology



- coronary artery disease
- Prinzmetal's angina
- small vessel disease (syndrome X)
- arteritis
- coronary artery embolism
- thrombophilia
- congenital coronary arteries anomalies
- aortic dissection
- ↓ systemic blood pressure

Ischemic heart disease - etiology



- coronary artery disease
- Prinzmetal's angina
- small vessel disease (syndrome X)
- arteritis
- coronary artery embolism
- thrombophilia
- congenital coronary arteries anomalies
- aortic dissection
- ↓ systemic blood pressure

- anemia
- carboxy-haemoglobin

Ischemic heart disease - etiology

↓ O₂ supply

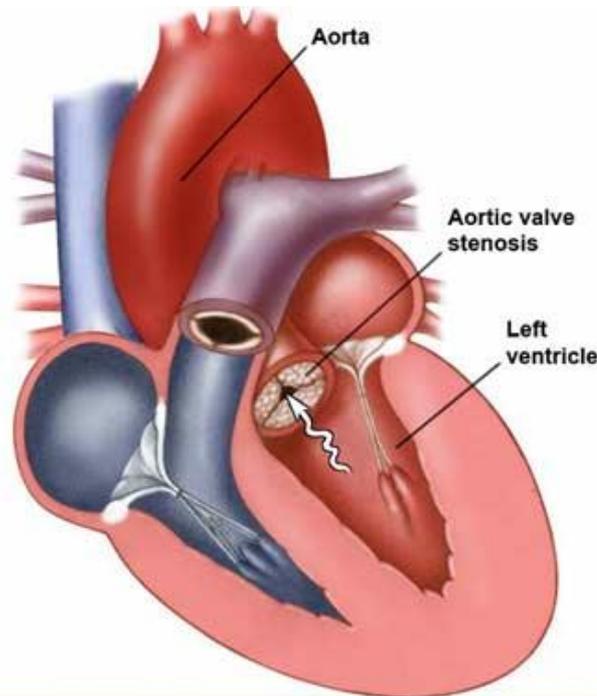
↑ O₂ demand

↓ blood flow

↓ transported
O₂ in the blood

- coronary artery disease
- Prinzmetal's angina
- small vessel disease (syndrome X)
- arteritis
- coronary artery embolism
- thrombophilia
- congenital coronary artery anomalies
- aortic dissection
- ↓ systemic blood pressure

- tachycardia
- hyperthyreosis
- aortic stenosis
- hypertrophic cardiomyopathy



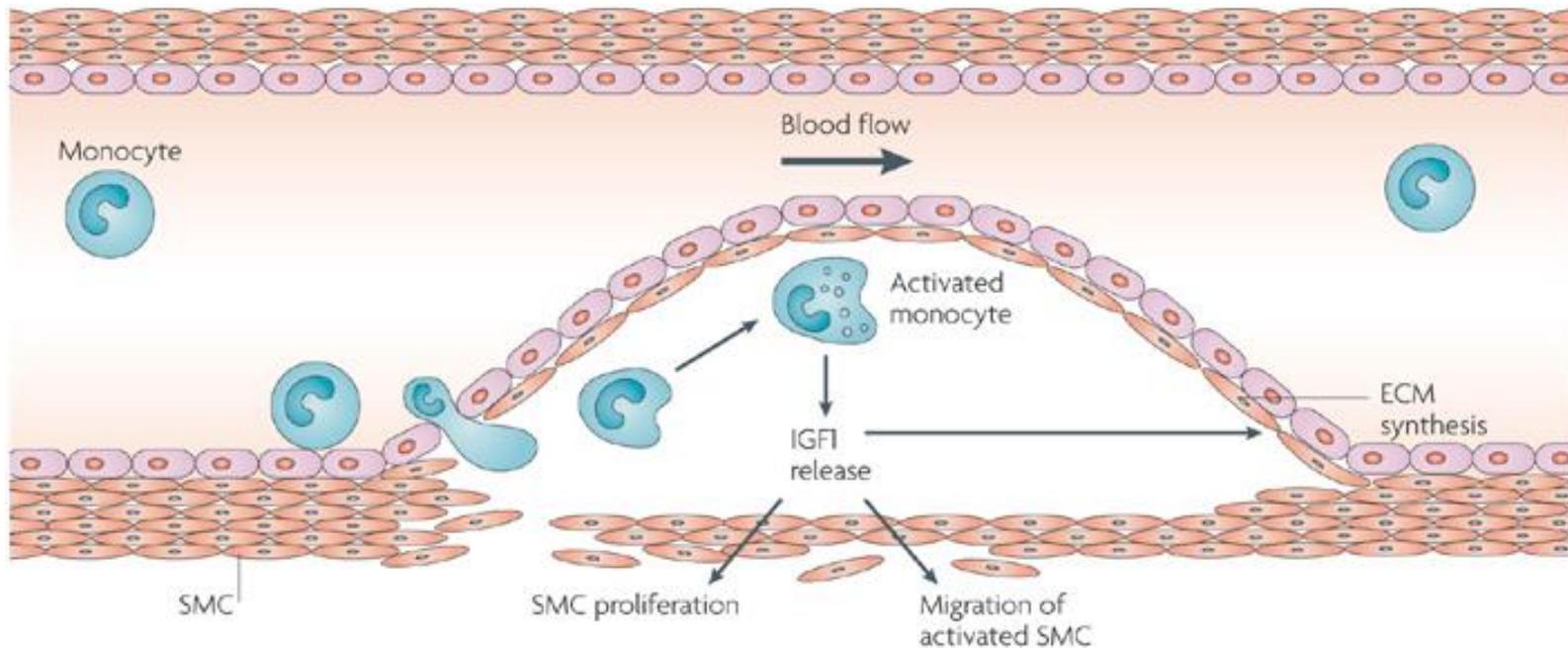


Coronary artery disease -
- atherosclerosis
of the coronary arteries

Pathogenesis of the atherosclerotic plaque

Endothelium

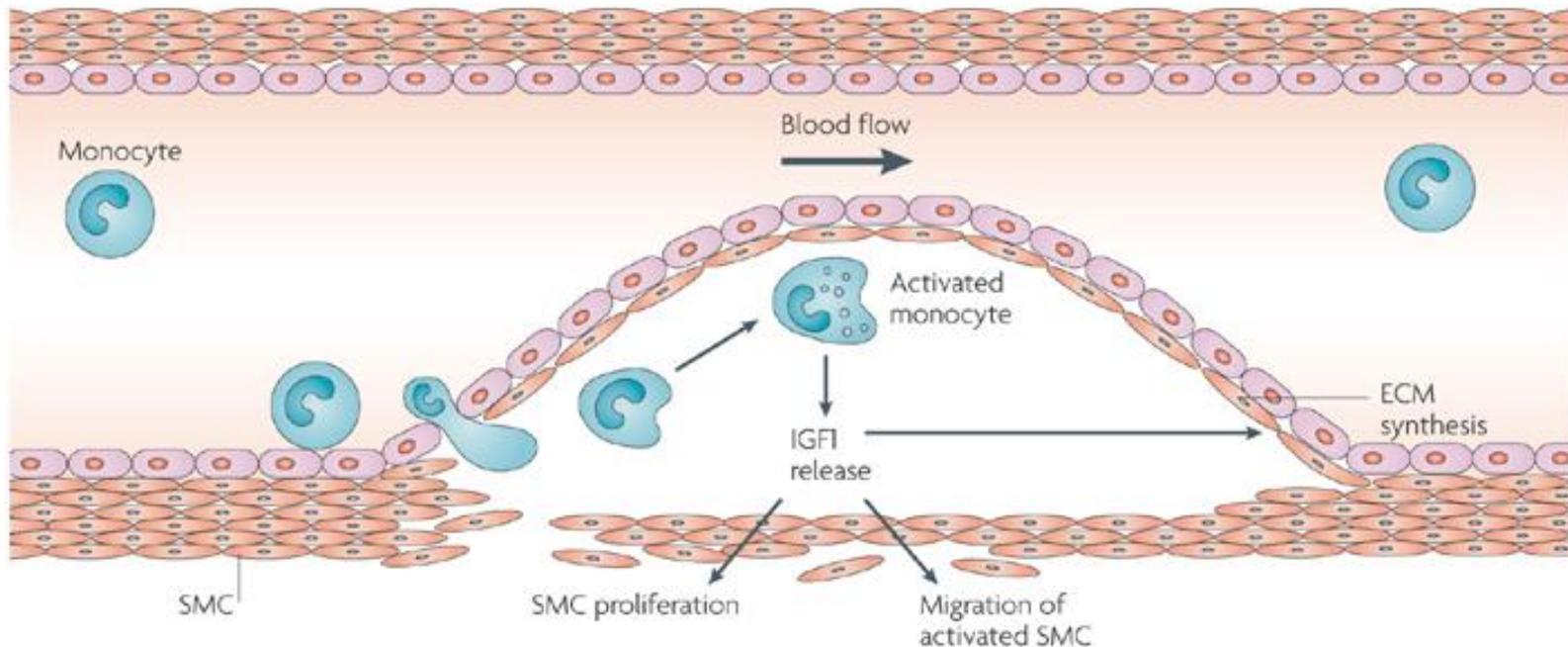
- **NO (nitric oxide)**
- **PGI₂ (prostacyclin)**



Pathogenesis of the atherosclerotic plaque

1. Stress to the endothelium:

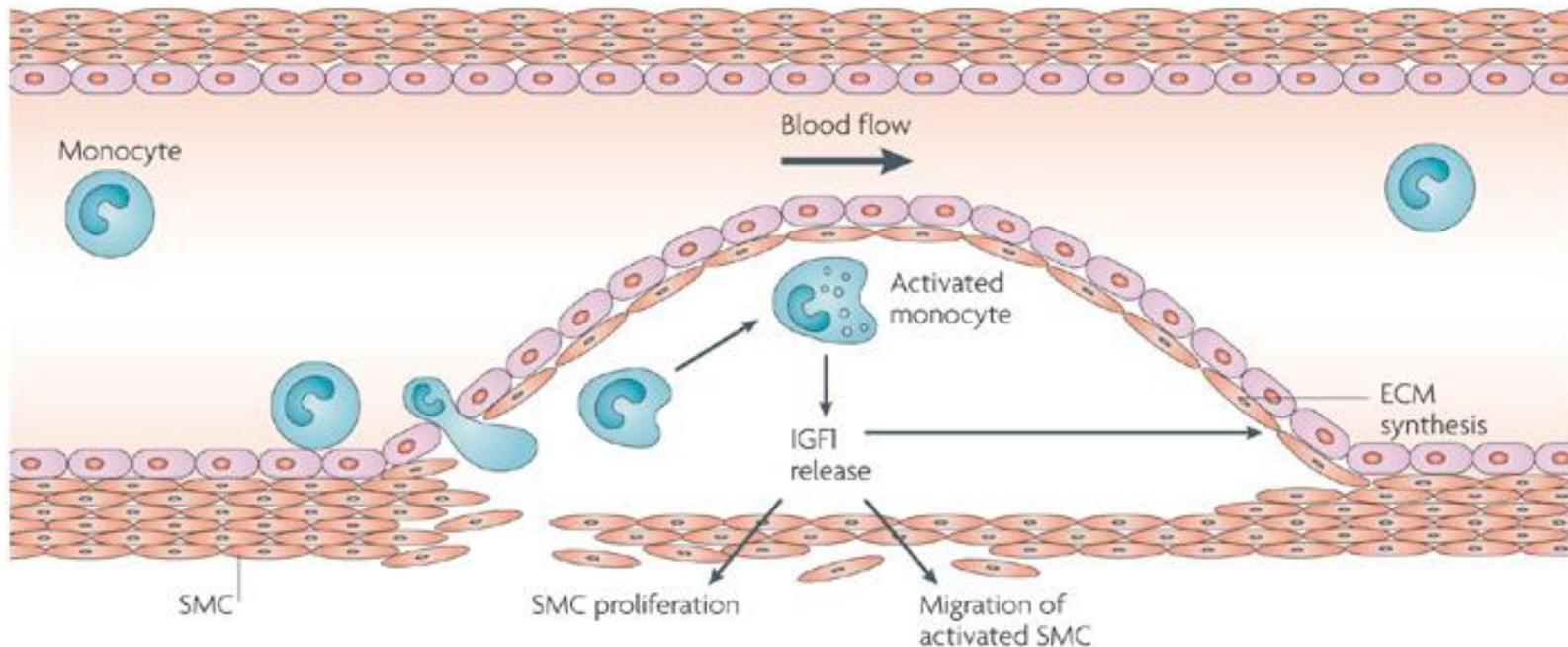
- turbulent blood flow (hypertension)
- oxydative stress:
 - smoking
 - oxydated LDL
 - non-enzymatic glycation (diabetes)



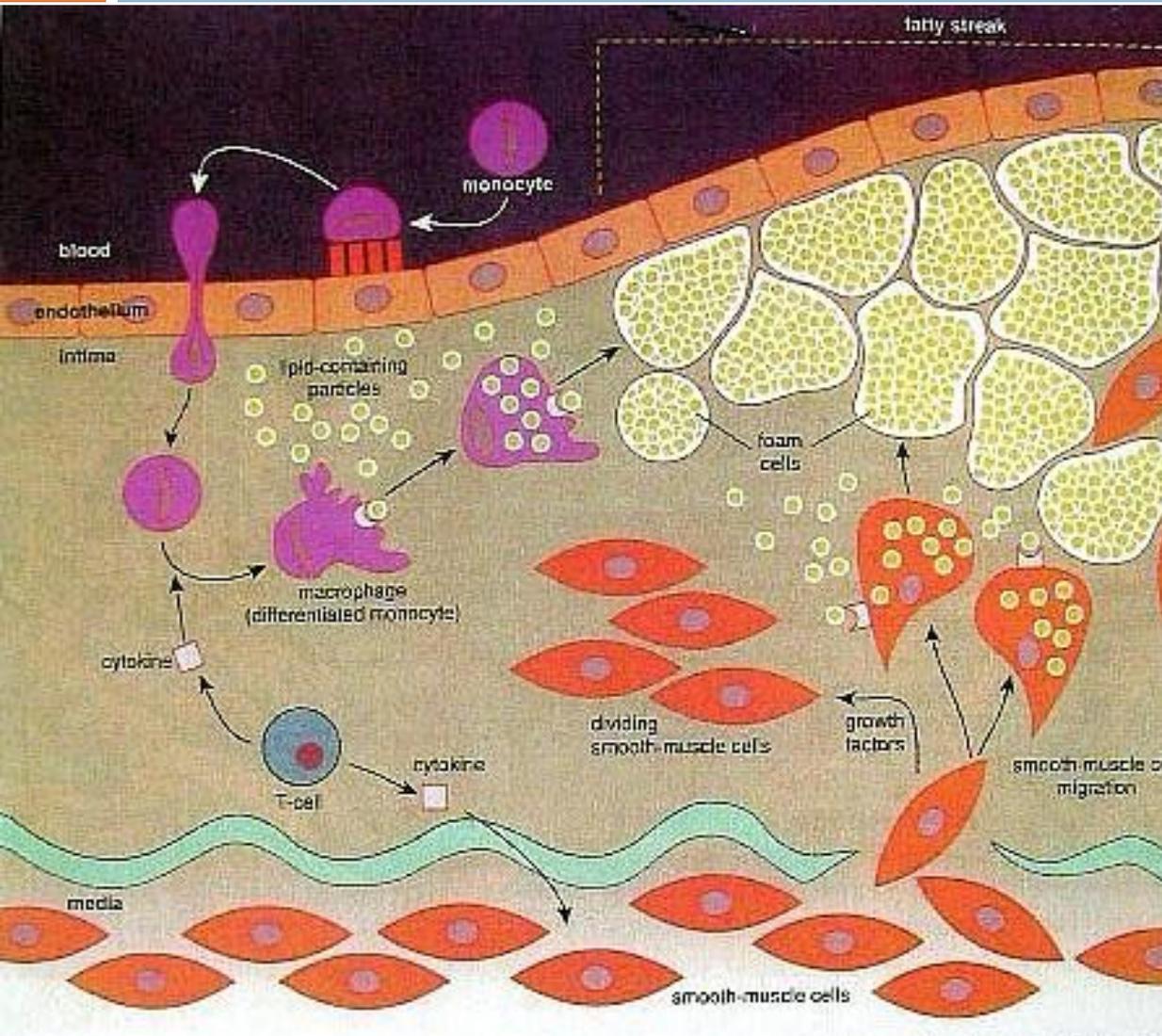
Pathogenesis of the atherosclerotic plaque

2. monocytes migration

monocytes → macrophages + oxy-LDL = "foam cells"



Pathogenesis of the atherosclerotic plaque



3. smooth muscle cell migration and activation

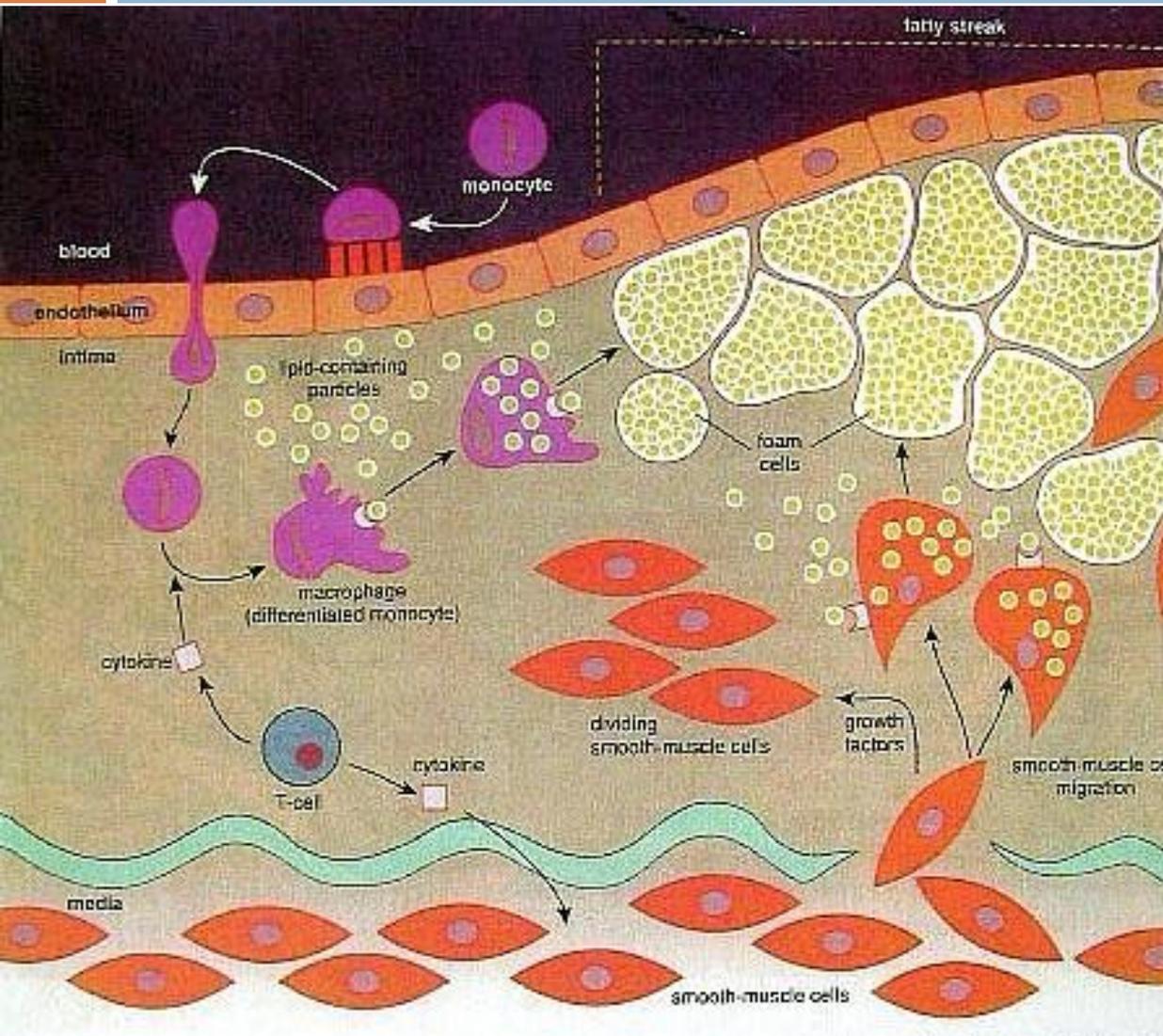
collagen → fibrous cup

4. migration of lymphocytes ...

production of cytokines

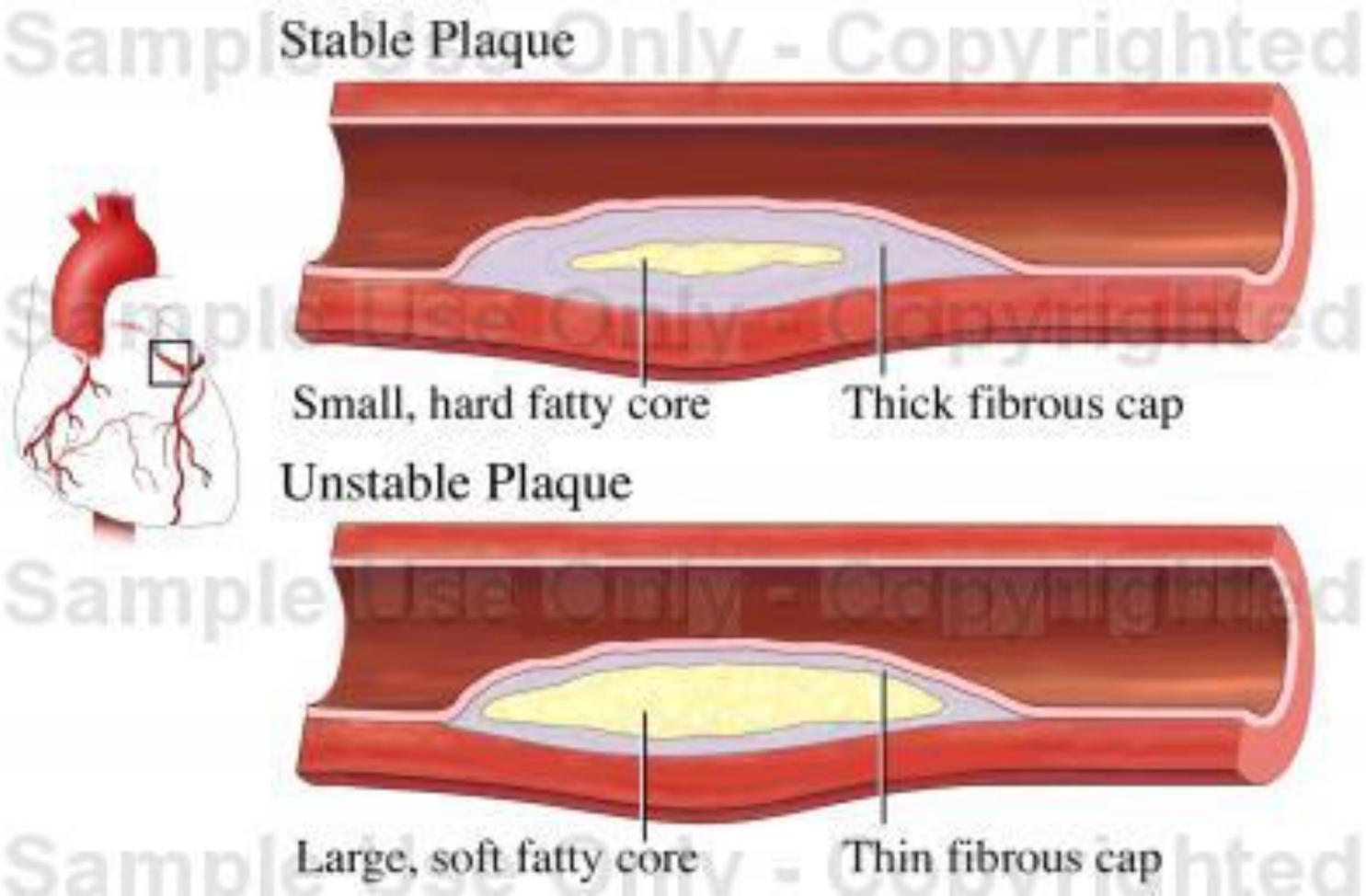
atherosclerosis =
= inflammation

Pathogenesis of the atherosclerotic plaque

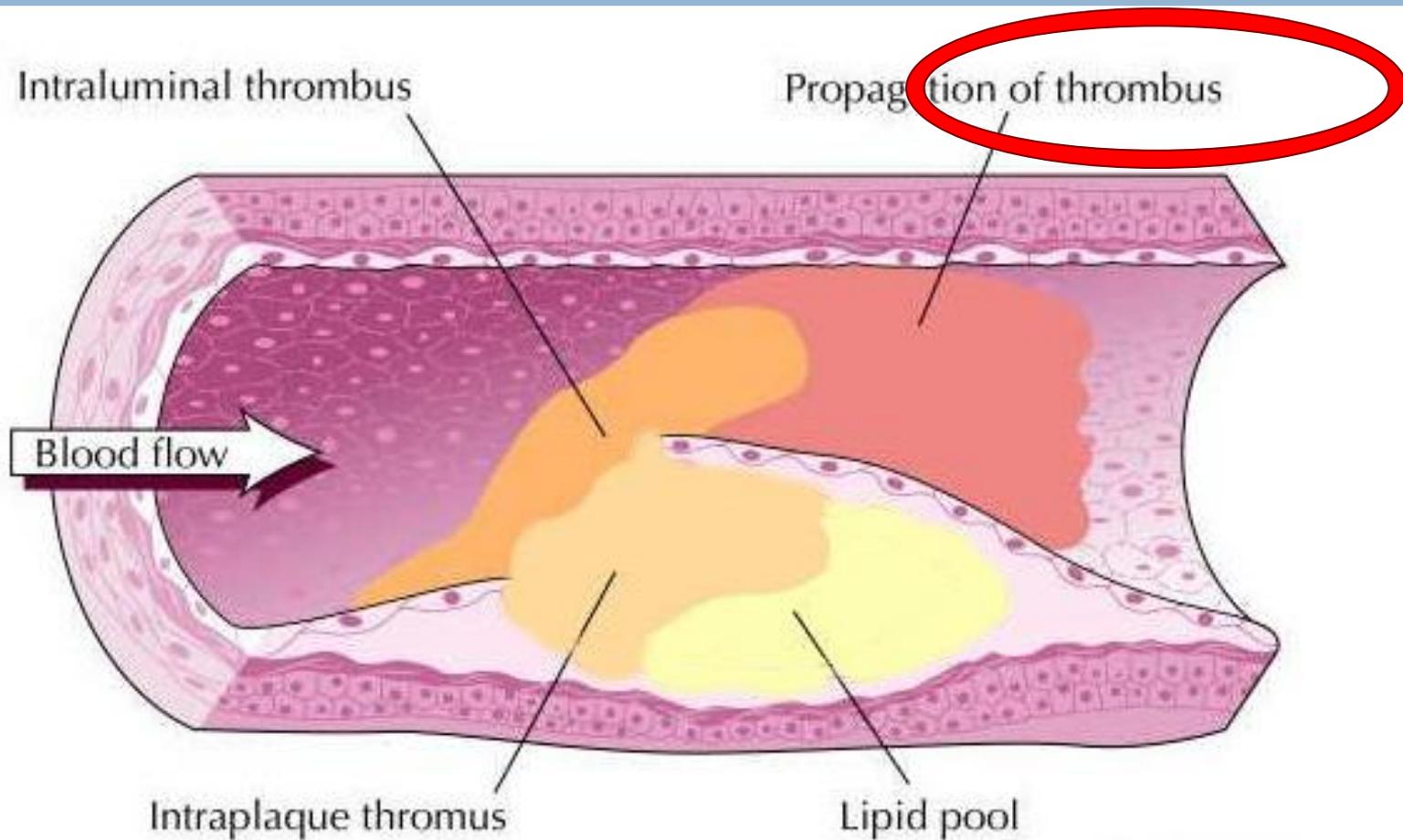


STATINS

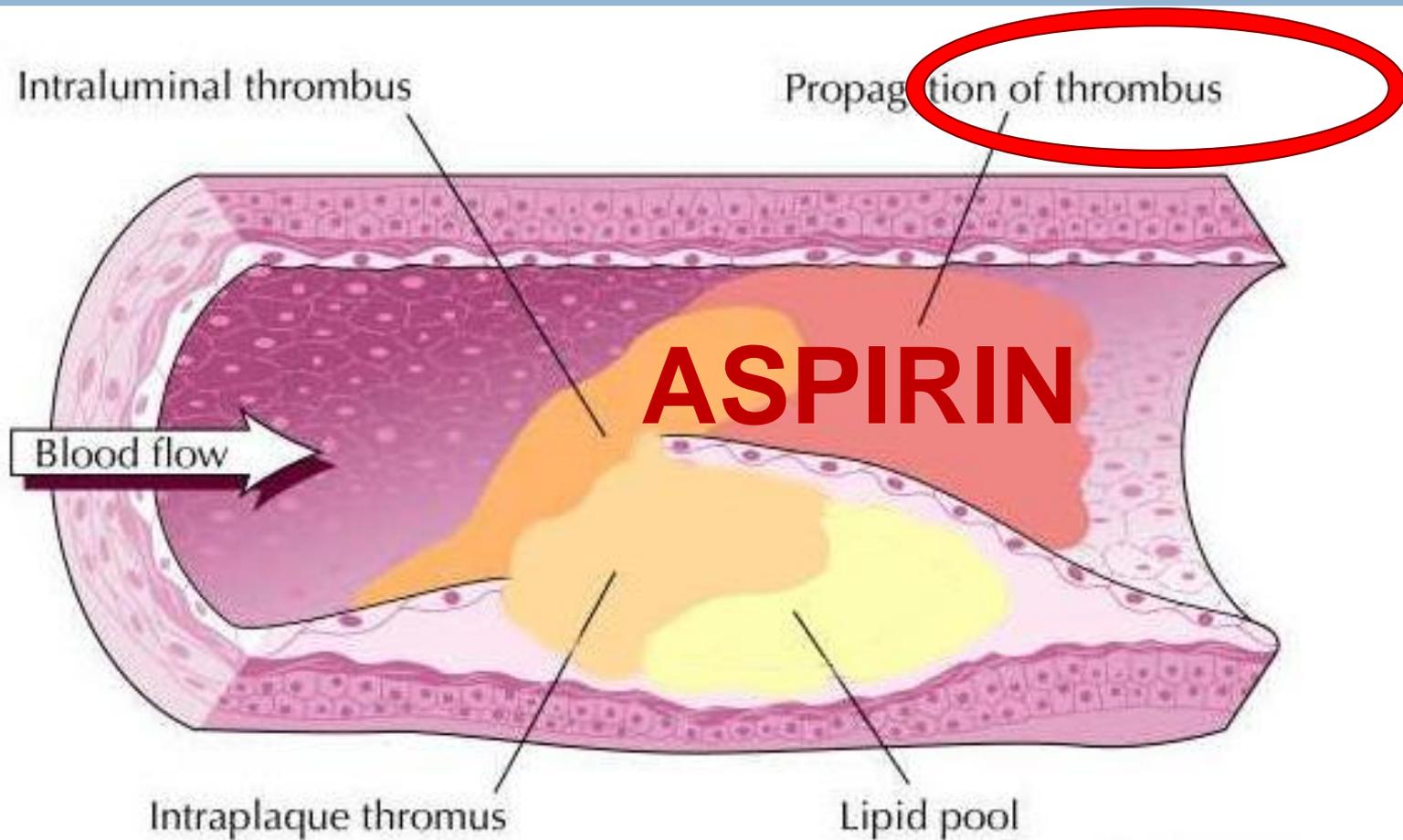
Stable vs. unstable atherosclerotic plaque



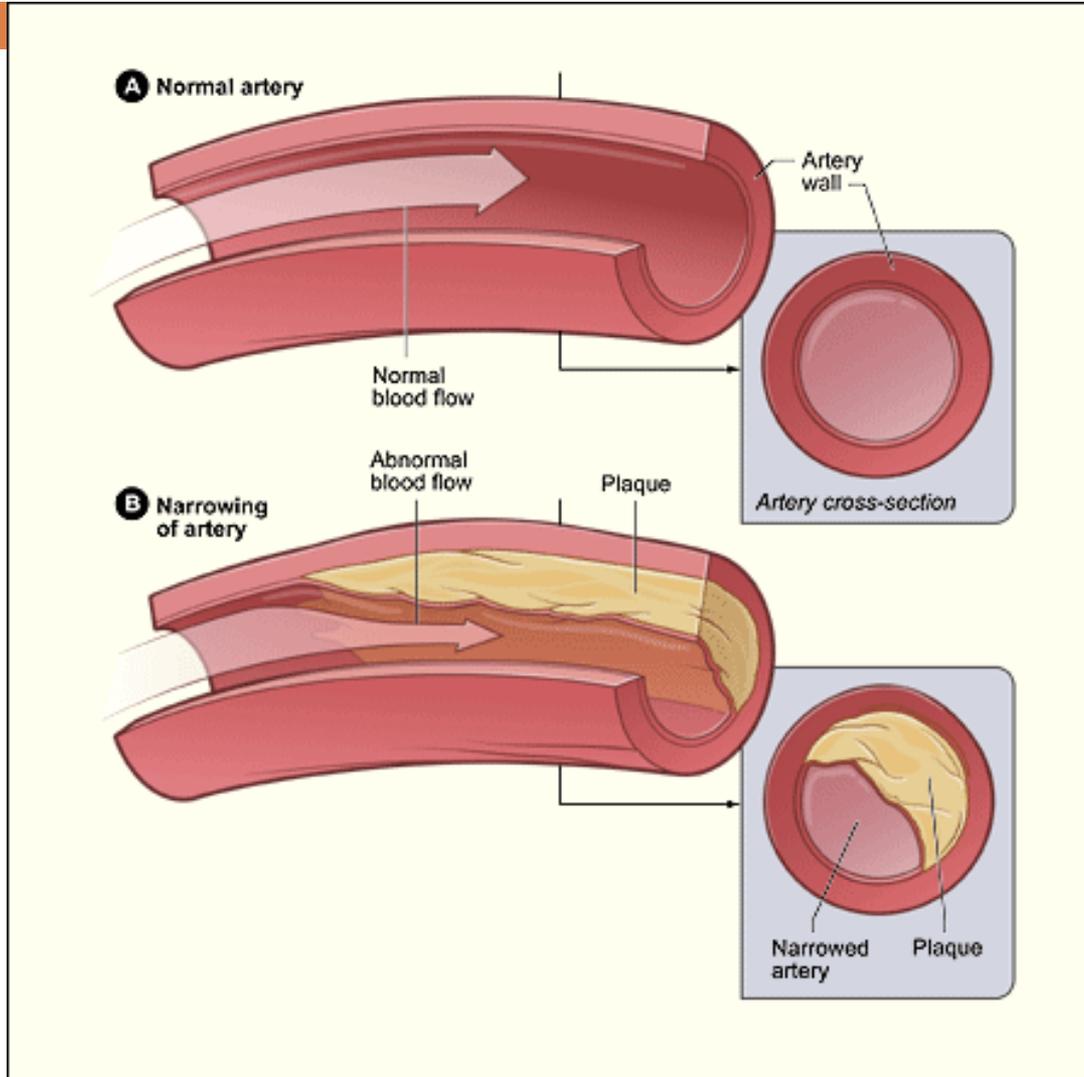
Unstable atherosclerotic plaque → ACS



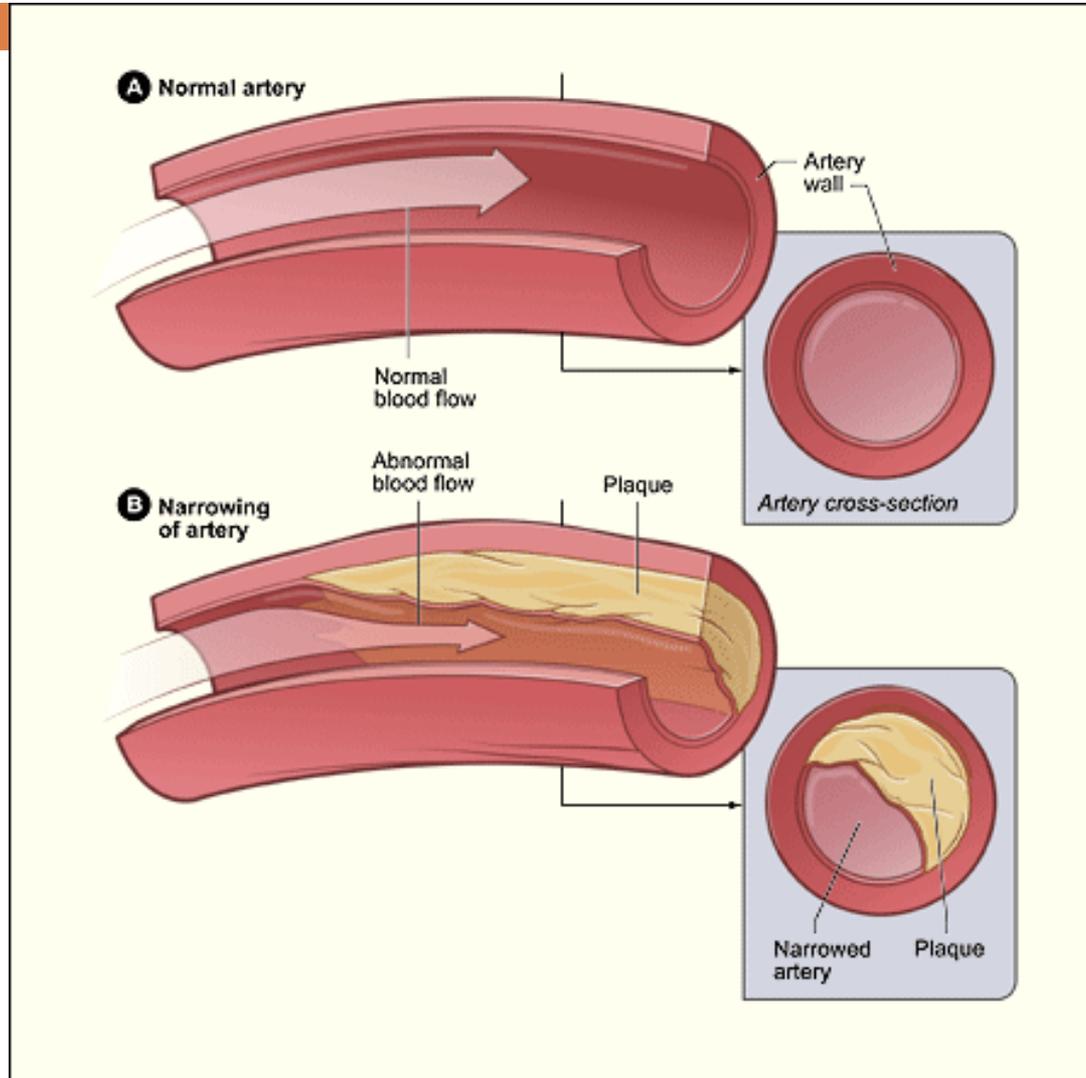
Unstable atherosclerotic plaque → ACS



Stable atherosclerotic plaque → stable CAD



Stable atherosclerotic plaque → stable CAD



At rest:

O_2 supply = O_2 demand

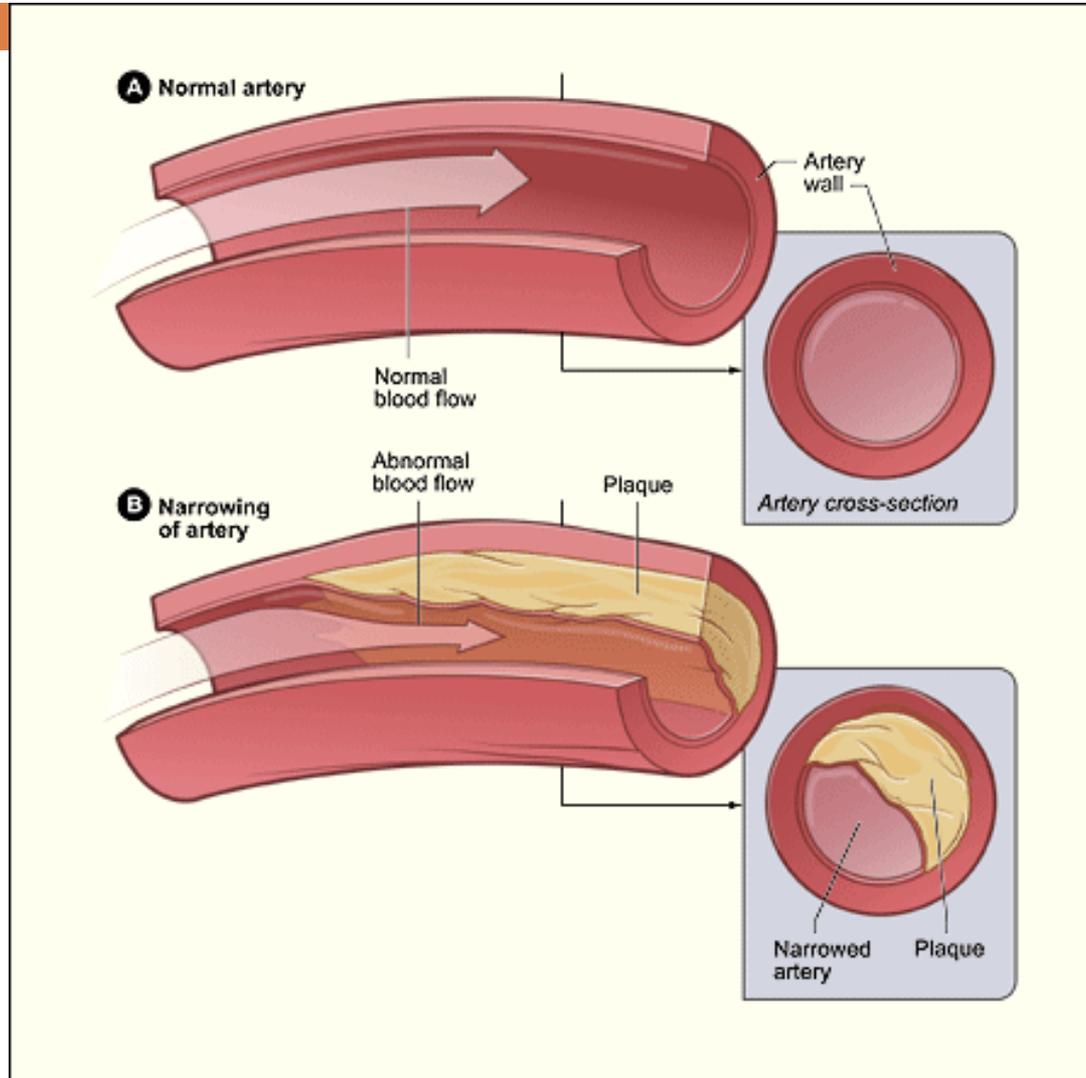
On exertion:

↑ O_2 demand

↑ O_2 supply

O_2 supply = O_2 demand

Stable atherosclerotic plaque → stable CAD



At rest:

O_2 supply = O_2 demand

On exertion:

↑ O_2 demand

-- O_2 supply

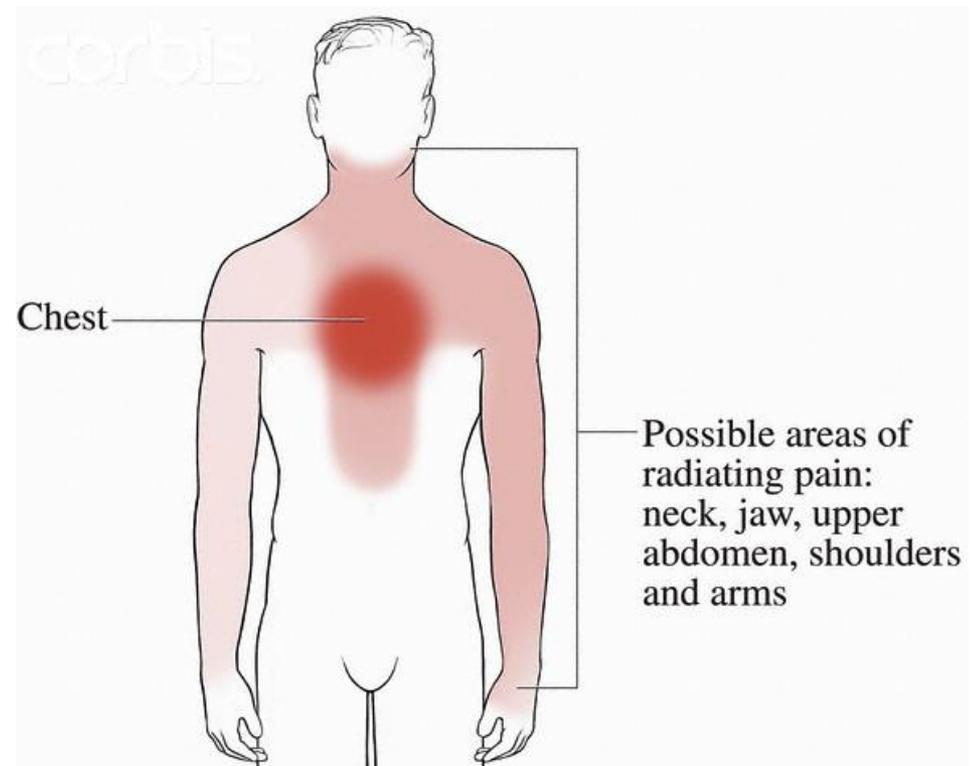
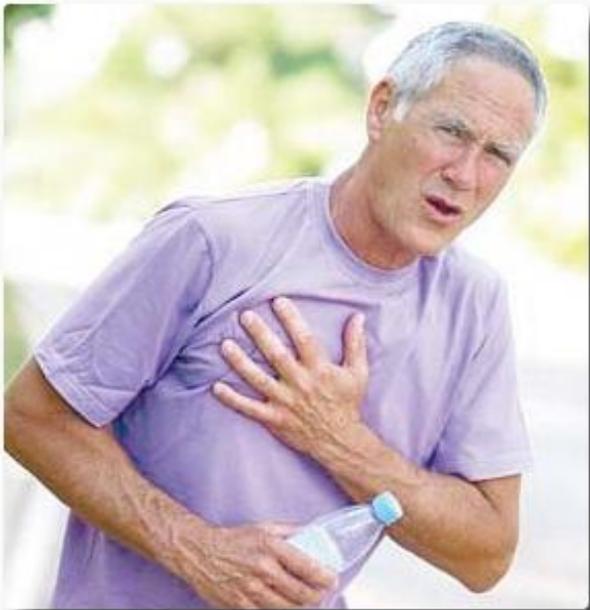
O_2 supply < O_2 demand

Typical anginal pain



Typical anginal pain

- 1) Pain onset (factors that provoke pain)
- 2) Pain character
- 3) Pain termination



Anginal equivalent

- Dyspnea
- Fatigue
- Dizziness & syncope
- Nausea

Diagnosis?

- Interview
- Physical examination
- Blood tests
- ECG
-?

Diagnosis?

□ Interview

- ~~Physical examination~~
- ~~Blood tests~~
- ECG (during pain)
- **Stress test: ECG, ECHO, SPECT, CMR, PET**
- **CT angiography**
- **Invasive coronary angiography**

Diagnosis?

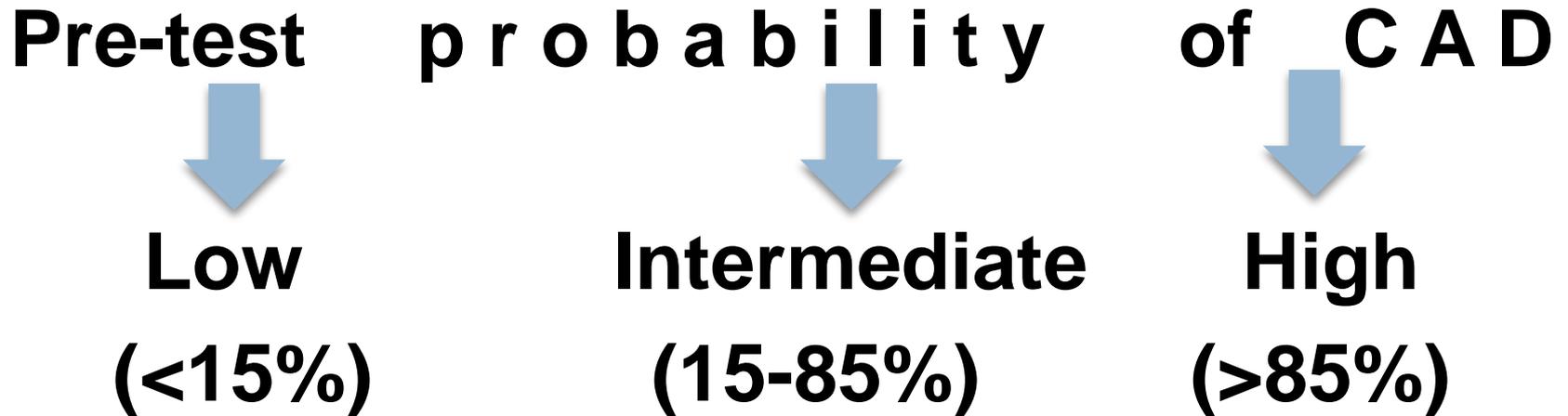
□ Interview

Pre-test probability of CAD

- 1) Risk factors (age, gender)**
- 2) Pain characteristic**

Diagnosis?

□ Interview



Diagnosis?

□ Interview

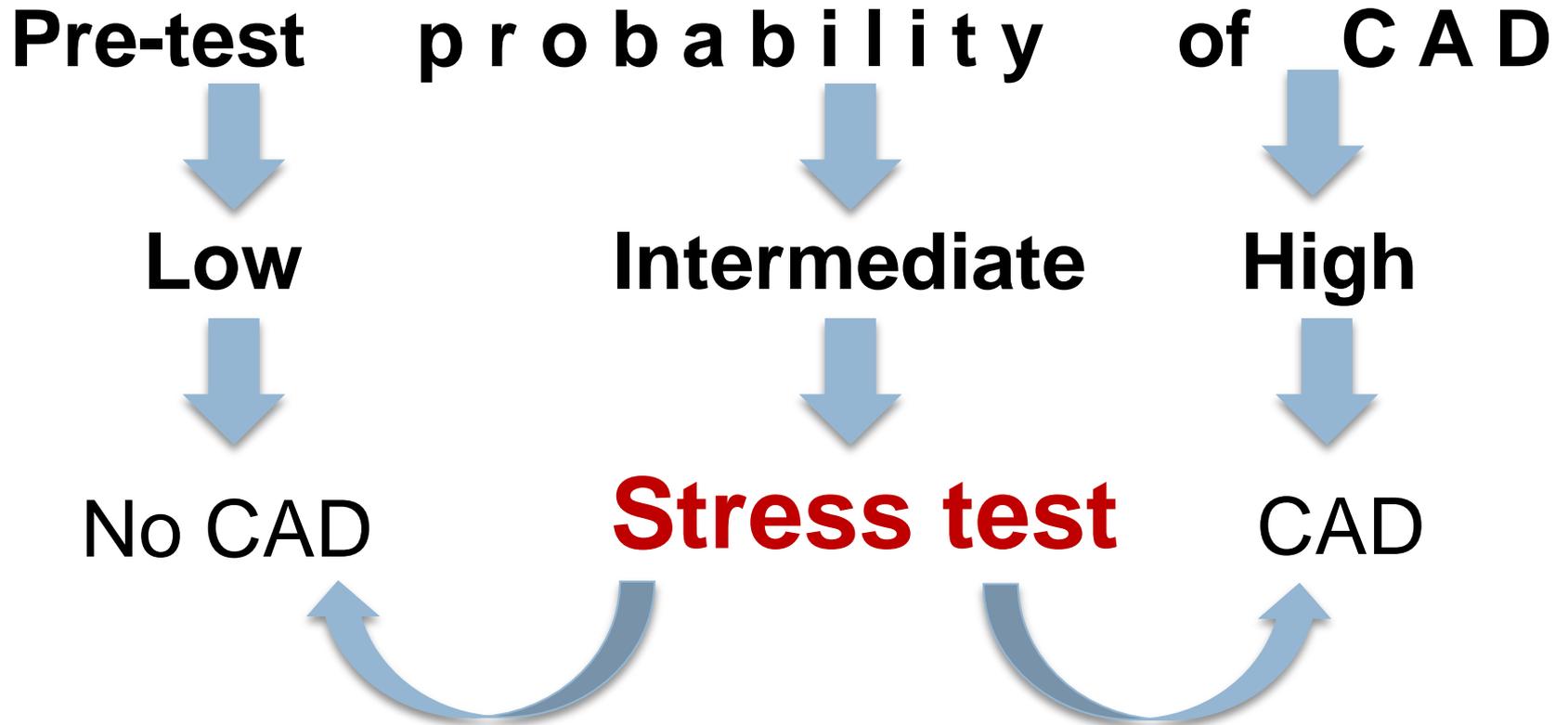


Table 13 Clinical pre-test probabilities^a in patients with stable chest pain symptoms¹⁰⁸

Age	Typical angina		Atypical angina		Non-anginal pain	
	Men	Women	Men	Women	Men	Women
30–39	59	28	29	10	18	5
40–49	69	37	38	14	25	8
50–59	77	47	49	20	34	12
60–69	84	58	59	28	44	17
70–79	89	68	69	37	54	24
>80	93	76	78	47	65	32

Diagnosis?

□ Interview

Pre-test probability of CAD

Low

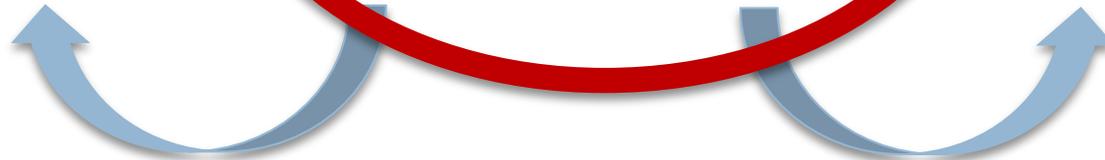
Intermediate

High

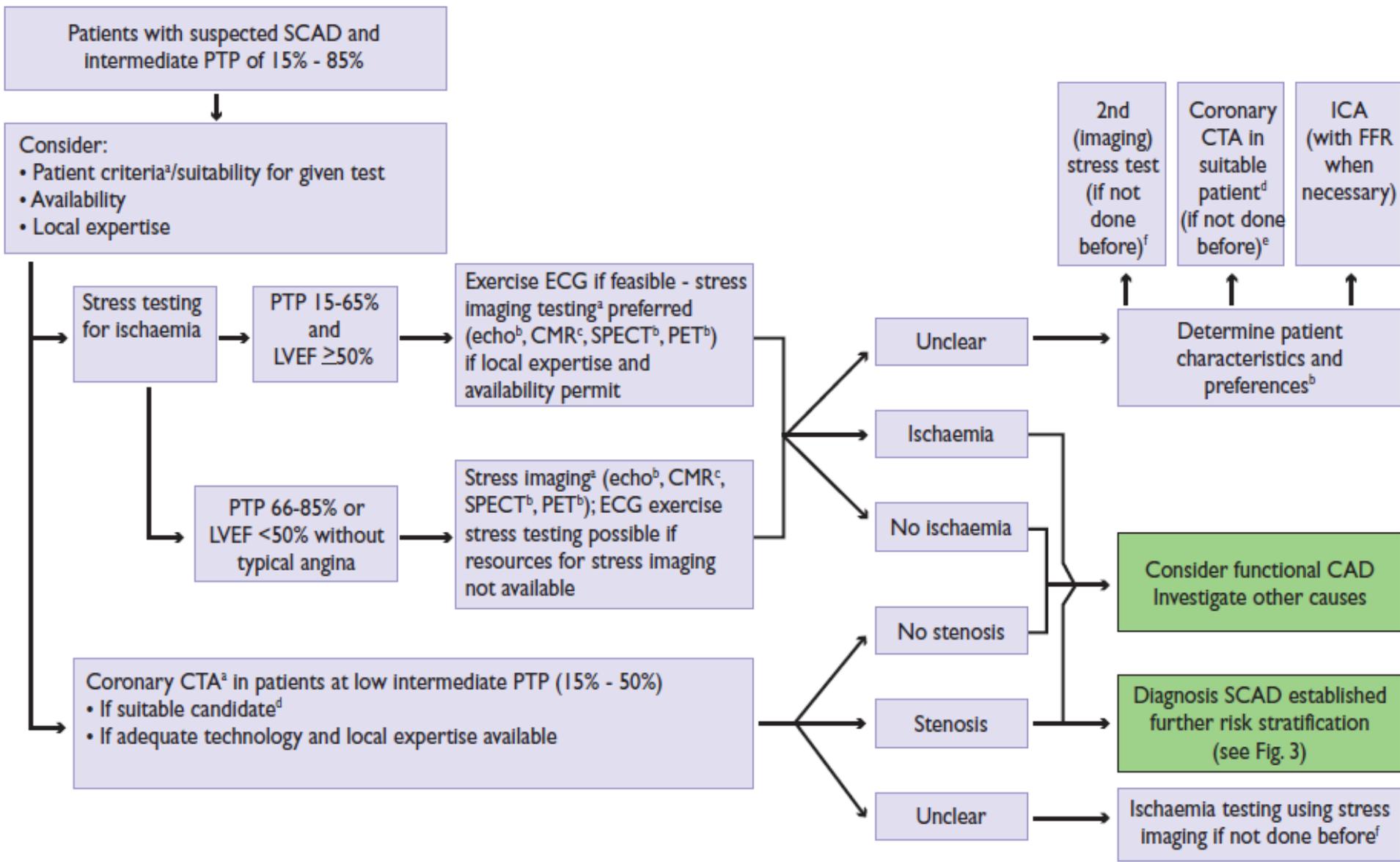
No CAD

Stress test

CAD



Intermediate pre-test probability of CAD



Diagnosis?

□ Interview

□ ~~Physical examination~~

□ ~~Blood tests~~

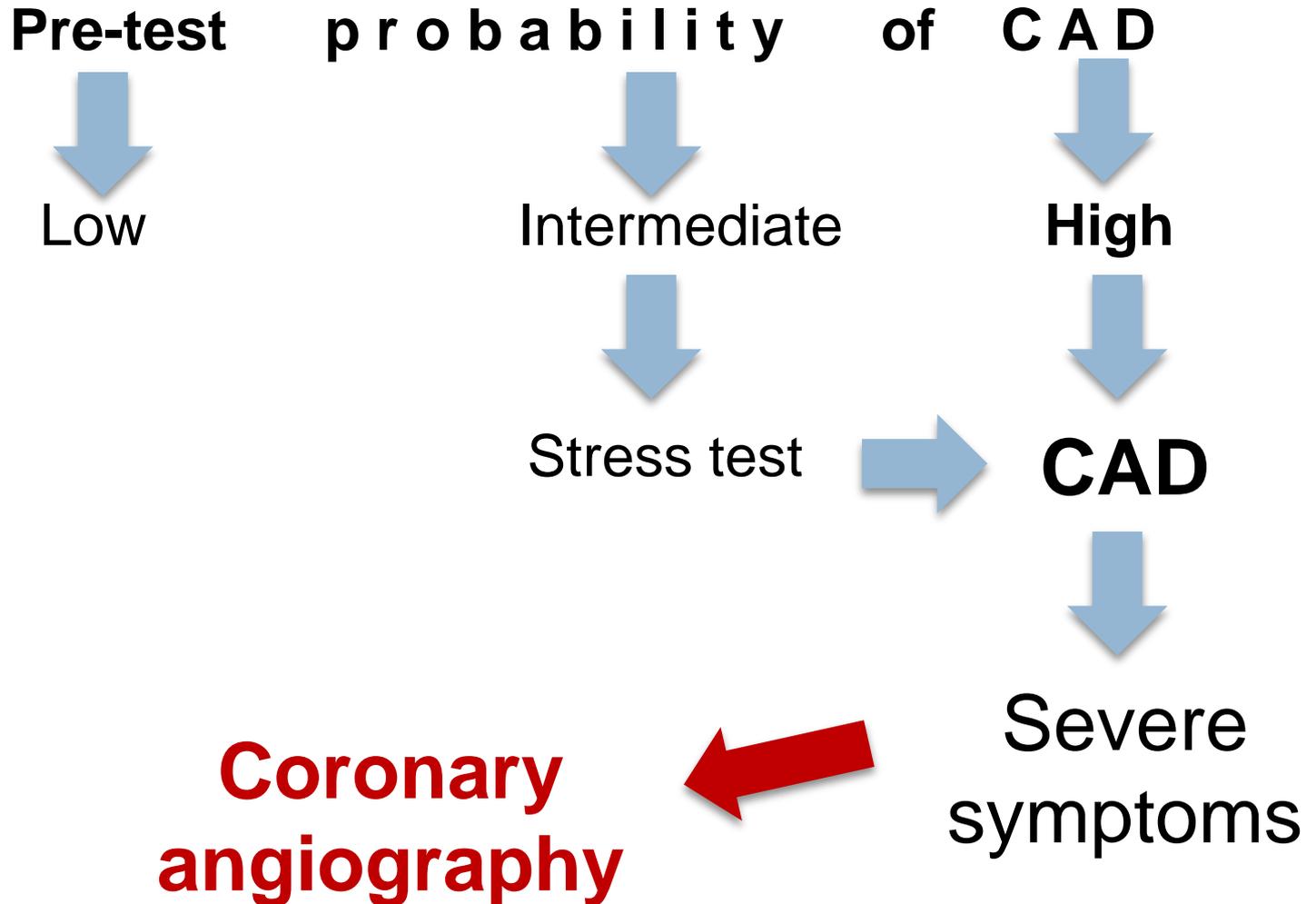
□ ECG (during pain)

□ **Stress test: ECG, ECHO, SPECT, CMR, PET**

□ **CT angiography**

□ **Invasive coronary angiography ?**

Diagnosis?



Stable CAD



Severe symptoms (CCS III/IV) despite OMT

or

high risk of CV death



Coronary angiography



Revascularization?

Indications for revascularization in stable CAD

Indication ^a	To improve prognosis:		To improve symptoms persistent on OMT:	
	Class ^d	Level ^e	Class ^d	Level ^e
A Heart Team approach to revascularization is recommended in patients with unprotected left main, 2–3 vessel disease, diabetes or comorbidities.	I	C	I	C
Left main >50% diameter stenosis ^b .	I	A	I	A
Any proximal LAD >50% diameter stenosis ^b .	I	A	I	A
2–3 vessel disease with impaired LV function / CHF.	I	B	IIa	B
Single remaining vessel (>50% diameter stenosis ^b).	I	C	I	A
Proven large area of ischaemia (>10% LV ^c)	I	B	I	B
Any significant stenosis with limiting symptoms or symptoms non responsive/intolerant to OMT.	NA	NA	I	A
Dyspnoea/cardiac heart failure with >10% ischaemia/viability ^c supplied by stenosis >50%.	IIb	B ^{429, 430}	IIa	B
No limiting symptoms with OMT in vessel other than left main or proximal LAD or single remaining vessel or vessel subtending area of ischaemia <10% of myocardium or with FFR ≥0.80.	III	A	III	C



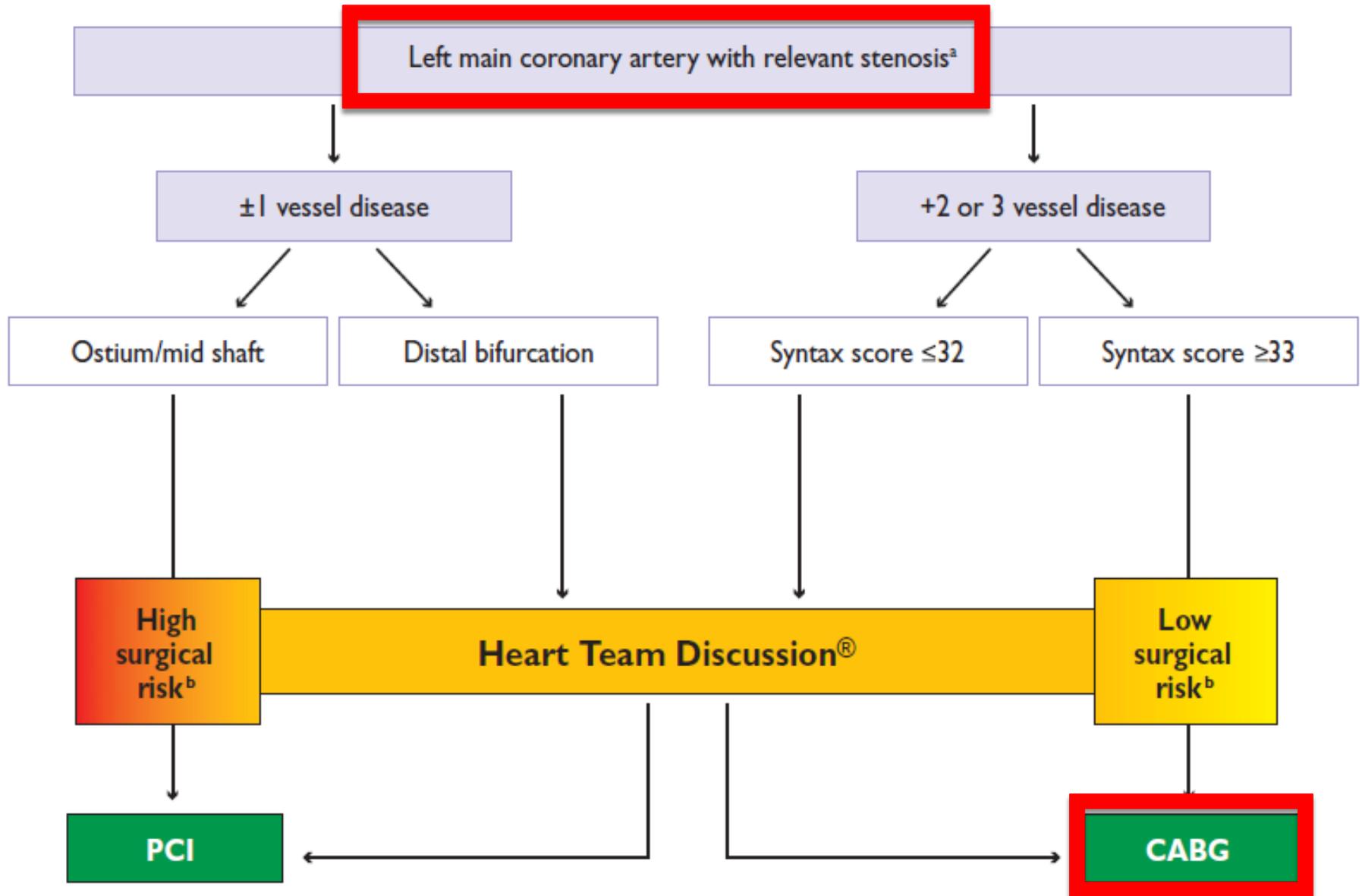
In **ACS** → revascularization (usually a.s.a.p.)

In **stable CAD** → revascularization only
in specific situations

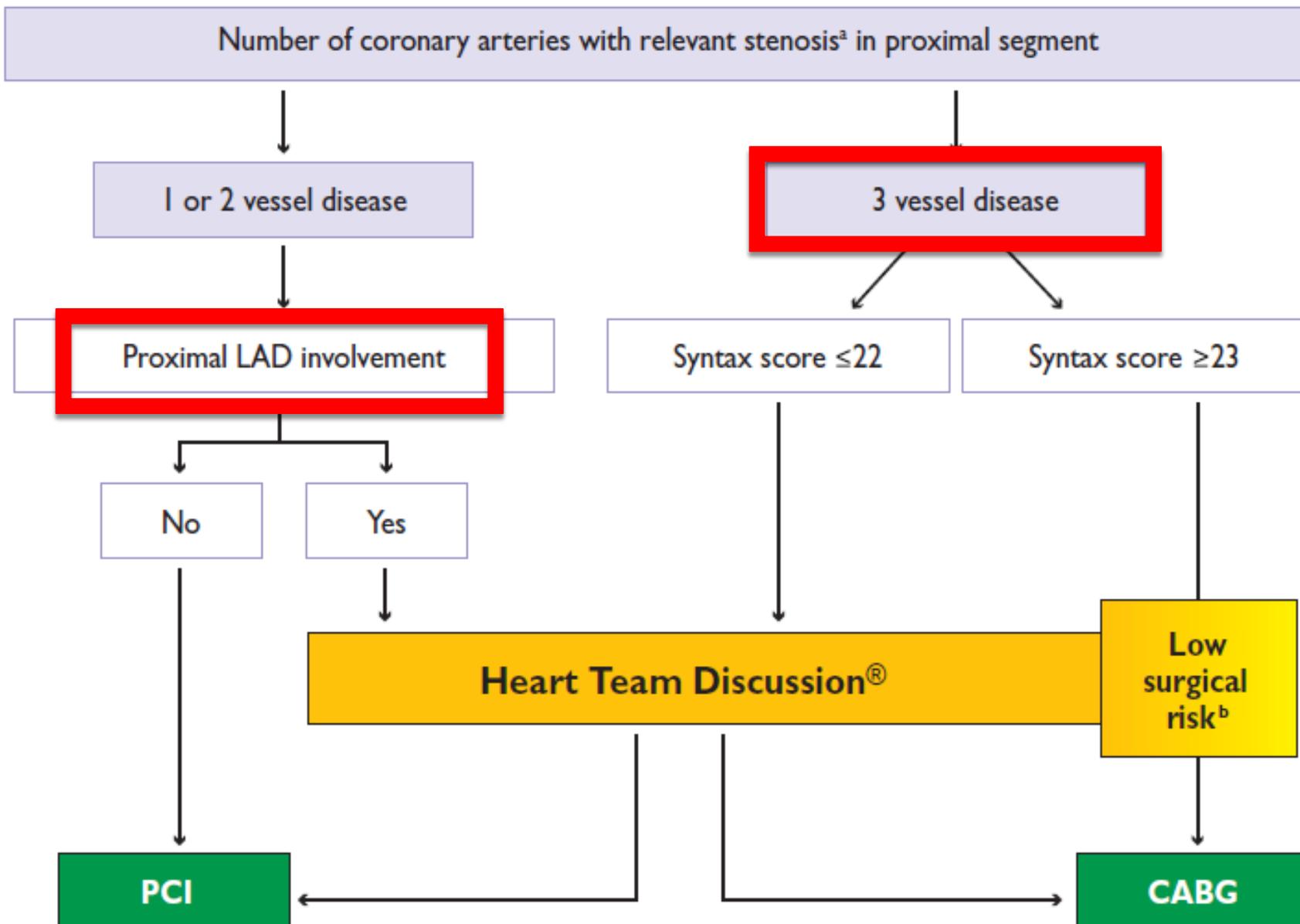
Revascularization in stable CAD: **PCI** or **CABG**?



Revascularization in stable CAD: **PCI** or **CABG**?



Revascularization in stable CAD: **PCI** or **CABG**?



Canadian Cardiovascular Society

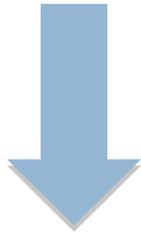
CCS class	Class characteristic
I	No limitation of ordinary activity. Angina occurs with sudden, intensive or prolonged exertion at work or recreation
II	Slight limitation of ordinary activity. Angina occurs: <ul style="list-style-type: none">- on walking or climbing stairs rapidly- on walking > 200 m at a normal pace- on climbing > 1 flight of stairs at a normal pace- walking in cold, in wind, after heavy meals- within a few hours after awakening- under emotional stress
III	Marked limitation of ordinary physical activity. Angina occurs: <ul style="list-style-type: none">- on walking < 200 m at a normal pace- on climbing 1 flight of stair at a normal pace
IV	Any physical activity causes angina. Angina can occur at rest

Canadian Cardiovascular Society

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IV	Any physical activity causes angina. Angina can occur at rest

Classifications in cardiology

Ischemic heart disease



CCS
classificaton

Heart failure



NYHA
classificaton

Risk factors for atherosclerosis



Risk factors for atherosclerosis

Non-modifiable	Modifiable
Age	Smoking
Male gender	Hypertension
Family history	Diabetes mellitus
Ethnic origin	High TC & LDL levels
	Obesity & the metabolic syndrome (High TG, low HDL)
	High calorie high fat diet
	Physical inactivity

Risk factors for atherosclerosis

Age	Smoking
Male gender	Hypertension
Family history	Diabetes mellitus
Ethnic origin	High TC & LDL levels
Inflammation	Obesity & the metabolic syndrome (High TG, low HDL)
Oxidative stress	High calorie high fat diet
Fibrinogen, homocysteine	Physical inactivity

Hypertension?



Hypertension?

$\geq 140 / 90$ mmHg

Diabetes mellitus?



Classification of hyperglycaemic states

State	Fasting glycaemia (mg/dl)	Postprandial glycaemia (mg/dl)
Normal		
Impaired fasting glucose (IFG)		
Impaired glucose tolerance (IGT)		
Diabetes mellitus		

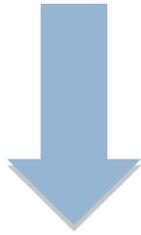
Classification of hyperglycaemic states

State	Fasting glycaemia (mg/dl)	Postprandial glycaemia (mg/dl)
Normal	< 100	< 140
Impaired fasting glucose (IFG)	100-125	
Impaired glucose tolerance (IGT)		140-199
Diabetes mellitus	≥ 126	≥ 200

The metabolic syndrome

Waist circumference			
	men	≥ 94 cm	(≥ 102 cm)
	women	≥ 80 cm	(≥ 88 cm)
Triglyceride (or treatment)		≥ 150 mg/dl	
HDL (or treatment)			
	men	< 40 mg/dl	
	women	< 50 mg/dl	
BP (or hypotensive treatment)		$\geq 130/85$ mmHg	
Glycaemia (or diagnosed DM t2)		≥ 100 g/dl	

Coronary artery disease prevention



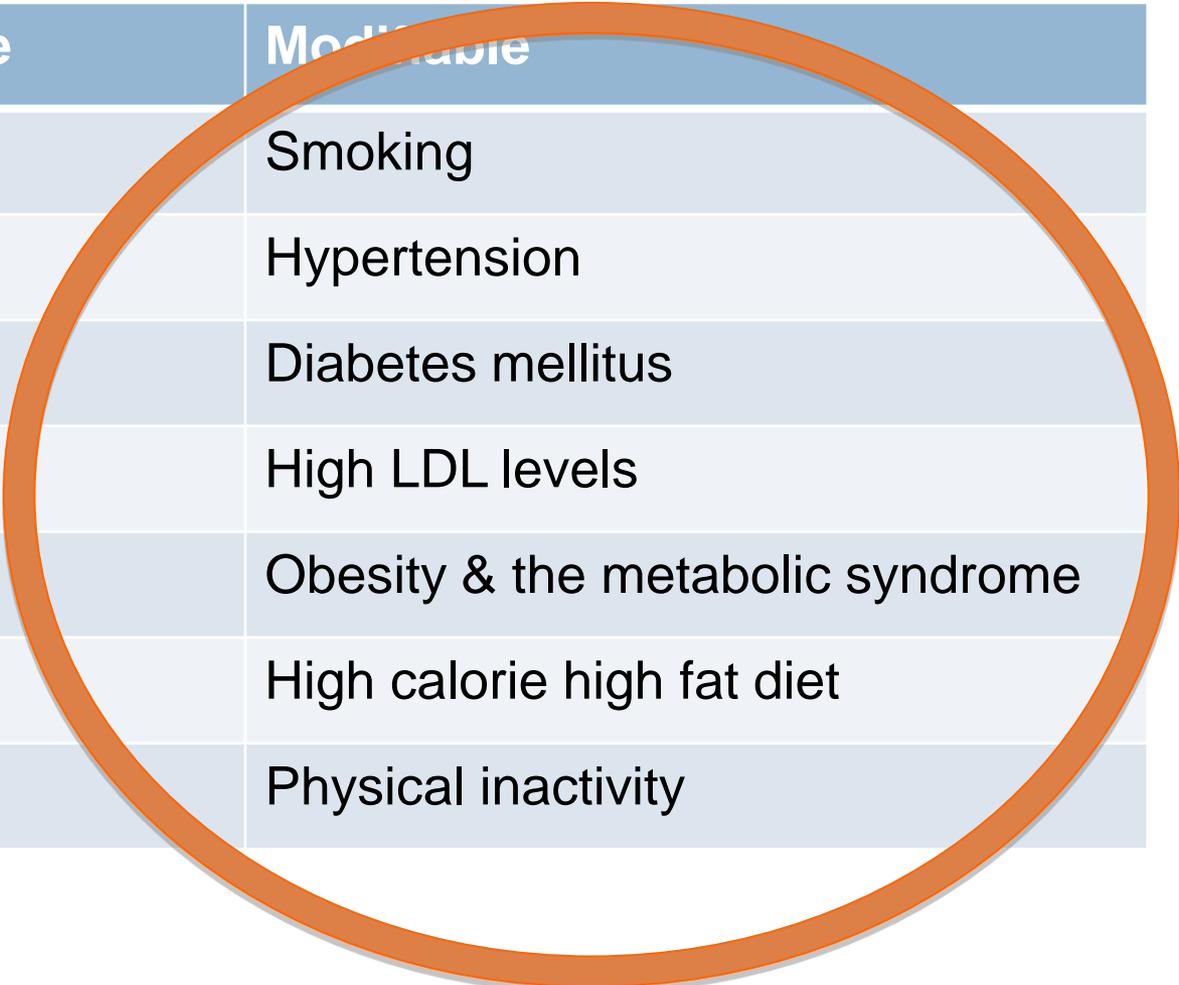
primary



secondary

Prevention

Non-modifiable	Modifiable
Age	Smoking
Male gender	Hypertension
Family history	Diabetes mellitus
	High LDL levels
	Obesity & the metabolic syndrome
	High calorie high fat diet
	Physical inactivity



Prevention

Non-modifiable	Modifiable
Age	Smoking
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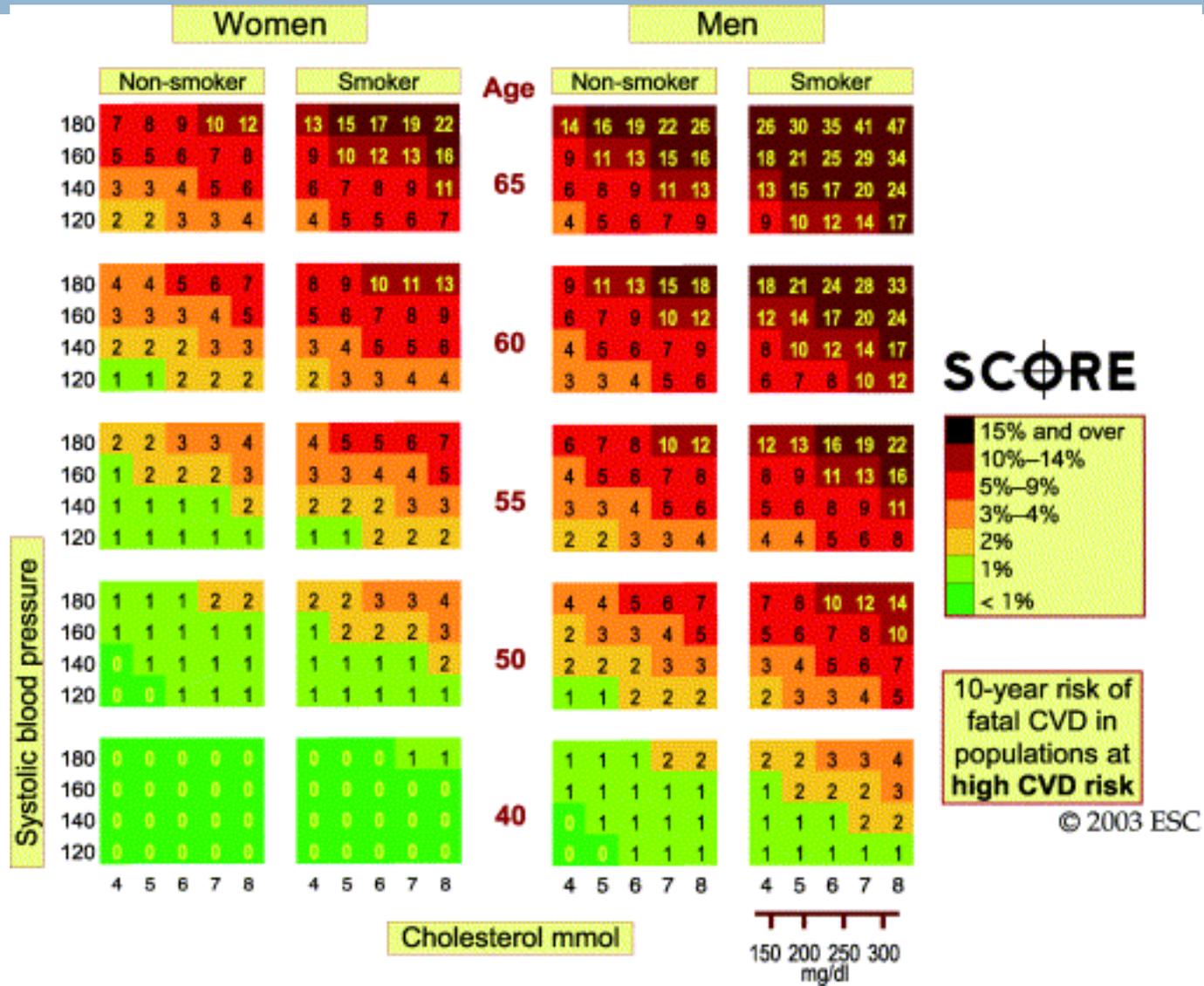
Prevention

Non-modifiable	Modifiable
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	Physical inactivity

Therapeutic goals

CV risk	Low / moderate	High	Very high
	SCORE <5%	SCORE 5-10%	<ul style="list-style-type: none">- established CVD- DM2- DM1 + complicat.- GFR<60 ml/min- SCORE ≥10%
LDL	<115 mg/dl	<100 mg/dl	<70 mg/dl or ↓ ≥50%

Low vs high global cardiovascular risk



Secondary prevention

What?	In whom?	What for? Prognosis	What for? Symptoms
Aspirin (75-150 mg)	Every patient with CVD	+	
Statin	Every patient with CVD	+	
ACE-inhibitor	Esp. in pts with DMt2, hypertension In all pts: post-MI , with HF	+	
Beta-blocker	CCS II-IV In all pts: post-MI , with HF	+ post-MI, HF	+
Calcium channel blockers (diltiazem, verapamil)	CCS II-IV		+
Long-acting nitrates	CCS II-IV		+
Short-acting nitrates	immediate short term symptomes relief		+
Ivabradine	CCS II-IV		+

Question 1

1. A 72-year old man, a smoker, complains of retrosternal chest pain and SOB after climbing 2 flights of stairs. The pain usually stops after 2-3 minutes of rest.

How would you diagnose CAD in this patient?

- a) I have just diagnosed it 😊
- b) perform a stress test
- c) perform coronary angiography
- d) run blood test for troponin concentration

Question 1

1. A 72-year old man, a smoker, complains of retrosternal chest pain and SOB after climbing 2 flights of stairs. The pain usually stops after 2-3 minutes of rest.

How would you diagnose CAD in this patient?

a) I have just diagnosed it 😊

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Question 2

2. A 72-year old man complains of retrosternal chest pain and SOB after climbing 2 flights of stairs. The pain usually stops after 2-3 minutes of rest.

What CCS class is he?

- a) CCS class I
- b) CCS class II
- c) CCS class III
- d) CCS class IV

Question 2

2. A 72-year old man complains of retrosternal chest pain and SOB after climbing 2 flights of stairs. The pain usually stops after 2-3 minutes of rest.

What CCS class is he?

a) CCS class I

b) CCS class II

c) CCS class III

d) CCS class IV

Question 3

3. Our patient is a smoker, normotensive and with LDL concentration of 100 mg/dl.

You recommend him to stop smoking.

What drugs would you prescribe him?

a) Aspirin, statin, long-acting nitrate

b) Aspirin, beta-blocker, short-acting nitrate

c) Aspirin, statin, beta-blocker, short-acting nitrate

d) Aspirin, ACE-inhibitor, long-acting nitrate

Question 3

3. Our patient is a smoker, normotensive and with LDL concentration of 100 mg/dl.

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c) Aspirin, statin, beta-blocker, short-acting nitrate

d) Aspirin, ACE-inhibitor, long-acting nitrate

Question 4

4. Our patient is a smoker, normotensive and with LDL concentration of 100 mg/dl.

What LDL level would you like him to achieve?

- a) it depends on his global cardiovascular risk, I would have to check in the EuroScore Risk Chart
- b) LDL < 115 mg/dl
- c) LDL < 100 mg/dl
- d) LDL < 70 mg/dl

Question 4

4. Our patient is a smoker, normotensive and with LDL concentration of 100 mg/dl.

What LDL level would you like him to achieve?

a) it depends on his global cardiovascular risk,
I would have to check in the EuroScore Risk Chart

b) LDL < 115 mg/dl

c) LDL < 100 mg/dl

d) LDL < 70 mg/dl

Question 5

5. Our patient comes back to you 3 months after his first visit. Since last week he has angina symptoms after climbing $\frac{1}{2}$ flight of stairs. What CCS class is he?

- a) CCS class I
- b) CCS class II
- c) CCS class III
- d) CCS class IV

Question 5

5. Our patient comes back to you 3 months after his first visit. Since last week he has angina symptoms after climbing $\frac{1}{2}$ flight of stairs. What CCS class is he?

a) CCS class I

b) CCS class II

c) CCS class III

d) CCS class IV

Question 6

6. What would you do in this patient?

- a) increase the dose of a beta-blocker
- b) increase the dose of aspirin and statin
- c) perform a stress test
- d) perform coronary angiography

Question 6

6. What would you do in this patient?

- a) increase the dose of a beta-blocker
- b) increase the dose of aspirin and statin
- c) perform a stress test
- d) perform coronary angiography



Thank you for your attention 😊