Chest Pain on Exertion: Stable Coronary Artery Disease

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Lecture Outline

- Describe the risk factors for ischaemic heart disease
- Obtain a medical history of chest pain
- Describe the characteristics of angina
- Differentiate between ischaemic chest pain from atypical chest pain
- Understand the investigational strategy for ischaemic heart disease
- Understand the basic pharmacological therapy for ischaemic heart disease
- Understand the basics of revascularisation procedures (PTCA and CABG)

Risk Factors for Cardiovascular Disease

Risk Factors You and Doctor Can Control (Modifiable)

- Blood pressure (BP)
- Cholesterol
- Diabetes
- Overweight/obesity
- Waist-to-Hip ratio
- Cigarette smoking
- Sedentary lifestyle and poor nutrition

Risk Factors You Cannot Control (Non-Modifiable)

- Family history of CVD
- Gender
- Age

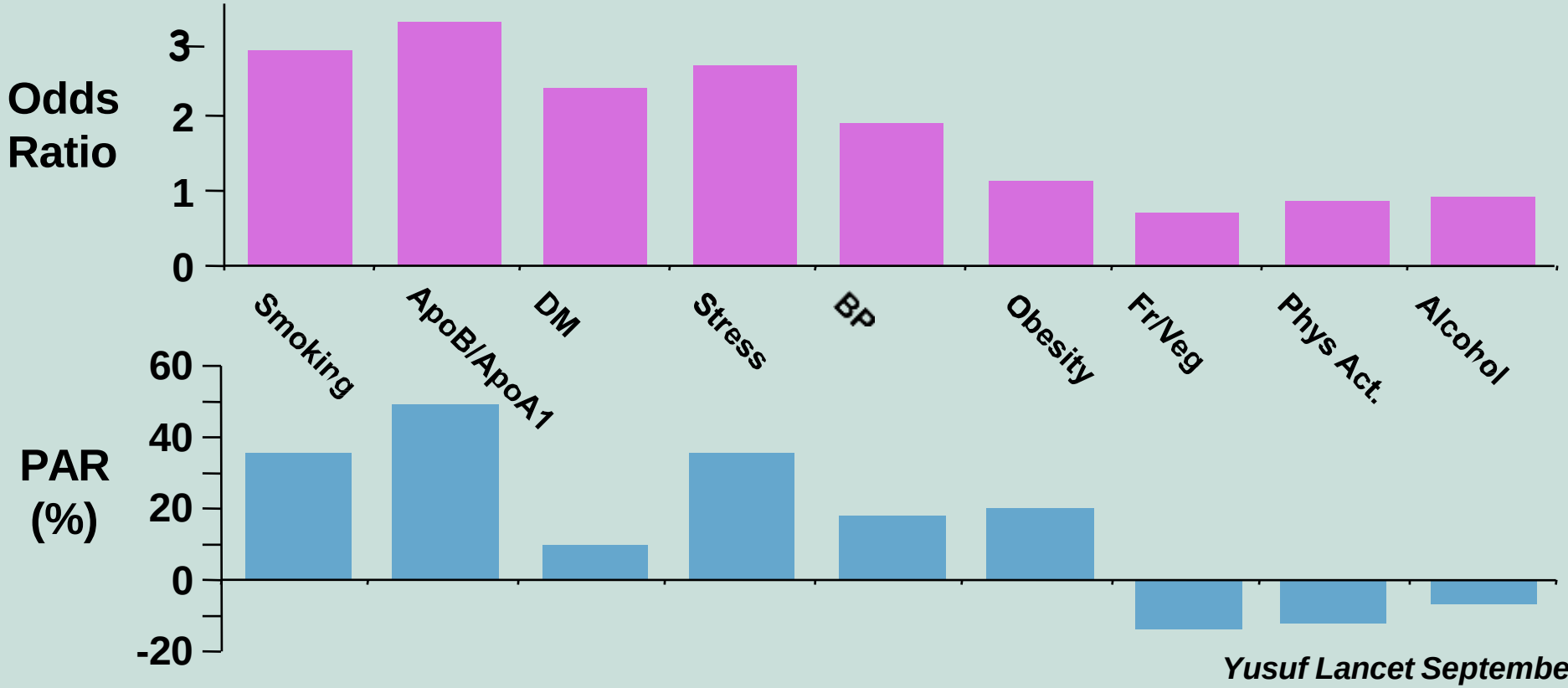
Adapted from the U.S. National Heart, Lung and Blood Institute. Available at: Accessed on January 12, 2005.

Critchley J et al. Explaining the increase in coronary heart disease mortality in Beijing between 1984 and 1999. Circulation 2004;110:1236-1244.

Potentially Modifiable Risk Factors and MI : INTERHEART Study

15152 Cases 14820 Controls in 262 Centres in 52 Countries

9 RF's accounted for 90% of MI in men and 94% in women



Yusuf Lancet September 11 2004

ABCDE of Prevention (ACC/AHA)

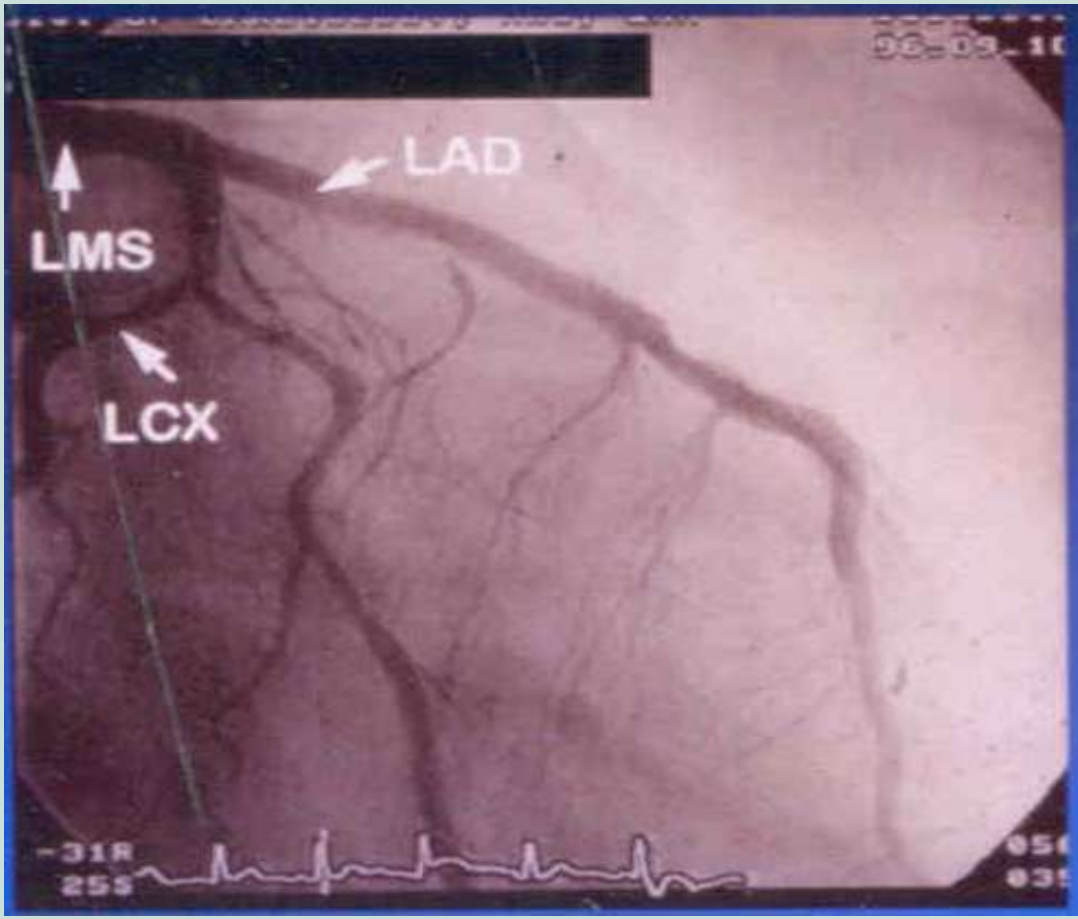
A = Aspirin and ACEI (ARB)

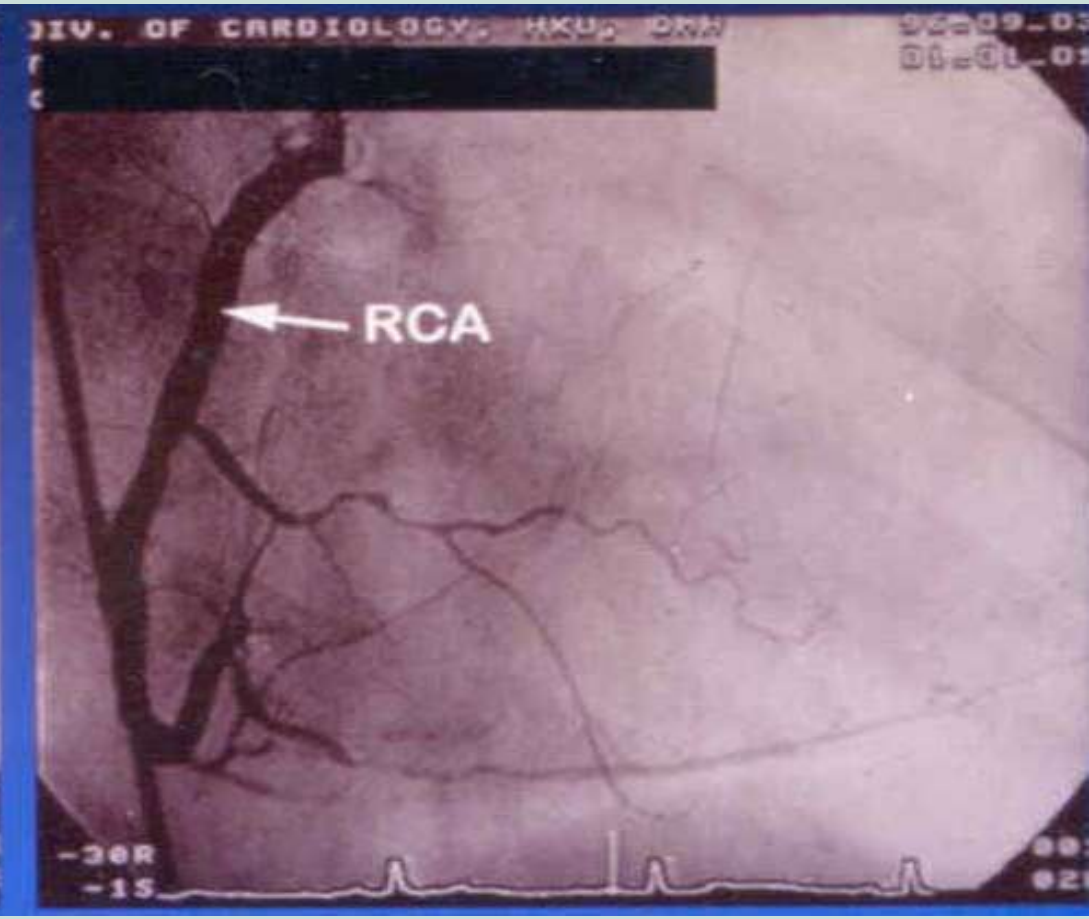
B= Beta blocker and blood pressure

C= Cigarette smoking and cholesterol

D= Diet and Diabetes

E= Education and Exercise


LAD
LMS
LCX


RCA

Causes of Chest pain (1)

1. Myocardial ischaemia : Angina pectoris / MI
    1. coronary atheroma, thrombus or vasospasm
    2. aortic valve disease or HCM
    3. Hypertension
    4. severe anaemia/thyrotoxicosis
2. Pericarditis
3. Aortic aneurysm : Dissecting, Rupture
4. Pulmonary embolism

Causes of Chest pain (2)

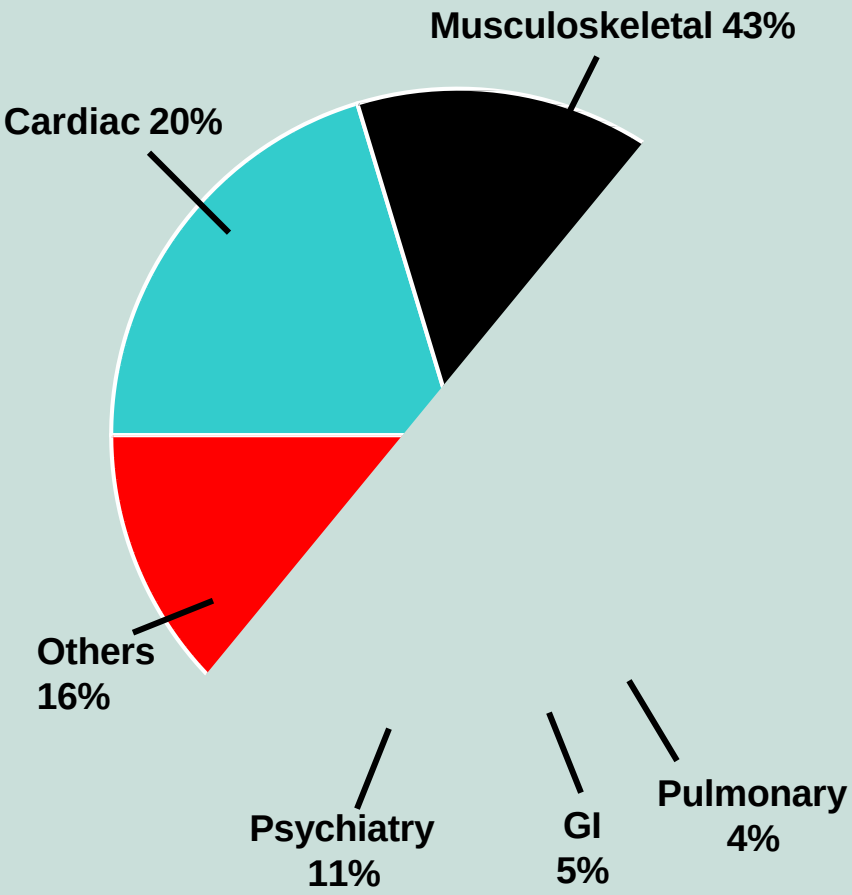
5. Pleurisy or pneumothorax
6. Osesophageal pain (acid reflux, spasm, carcinoma)
7. Chest wall lesions
   - (I) rib fracture
   - (ii) metastatic deposits in ribs
   - (iii) fibrositis or myalgia
   - (iv) herpes zoster
8 Gastric or duodenal ulcer
9. Gallbladder colic
10. Pain referred from thoracic or cervical spine

Approach to Chest Pain fort

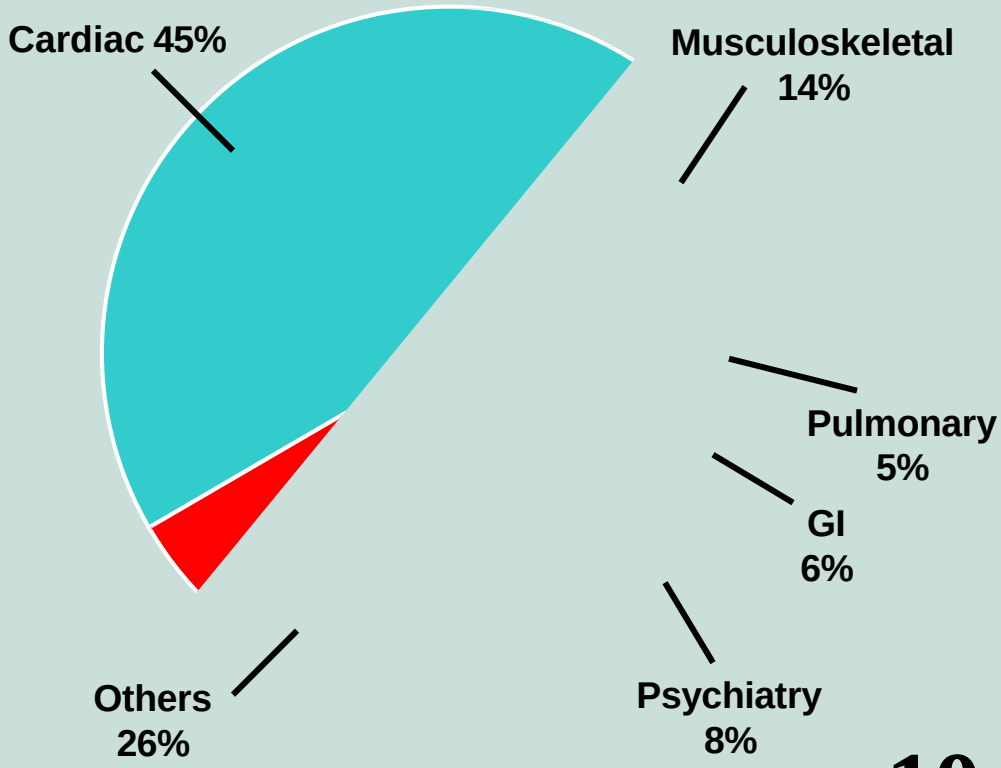
- New & acute onset
- Recurrent episodic
- Persistent

Aetiology of Chest Pain

GP



A & E



Recurrent Episodic Chest Pain

Typical Angina

Chest pain or fort brought on by exertion/emotional stresses, may radiate to arm or shoulder. Relieved with rest or sublingual nitrate within 5 minutes. Normally lasts 10-15 minutes (and <30 minutes)

Atypical Chest pain

Angina Pectoris

Common precipitating factors in angina pectoris: heavy meal, exertion, cold, smoking

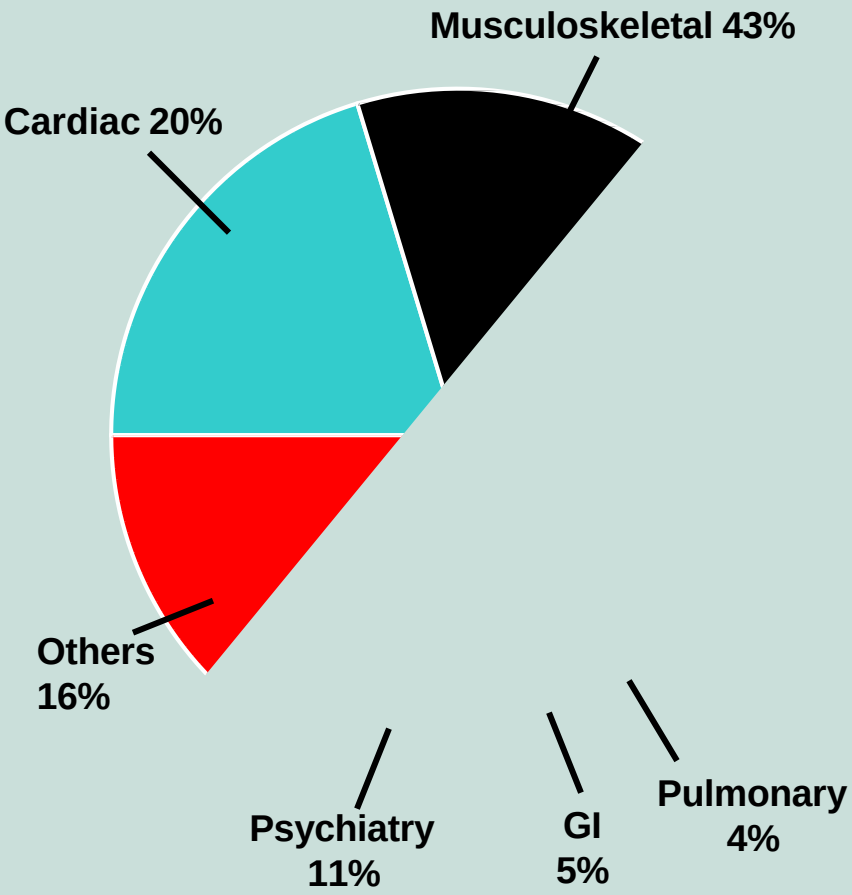
Characteristic distribution of pain in angina pectoris

F. Netter M.D.

© IGN

Aetiology of Chest Pain

GP



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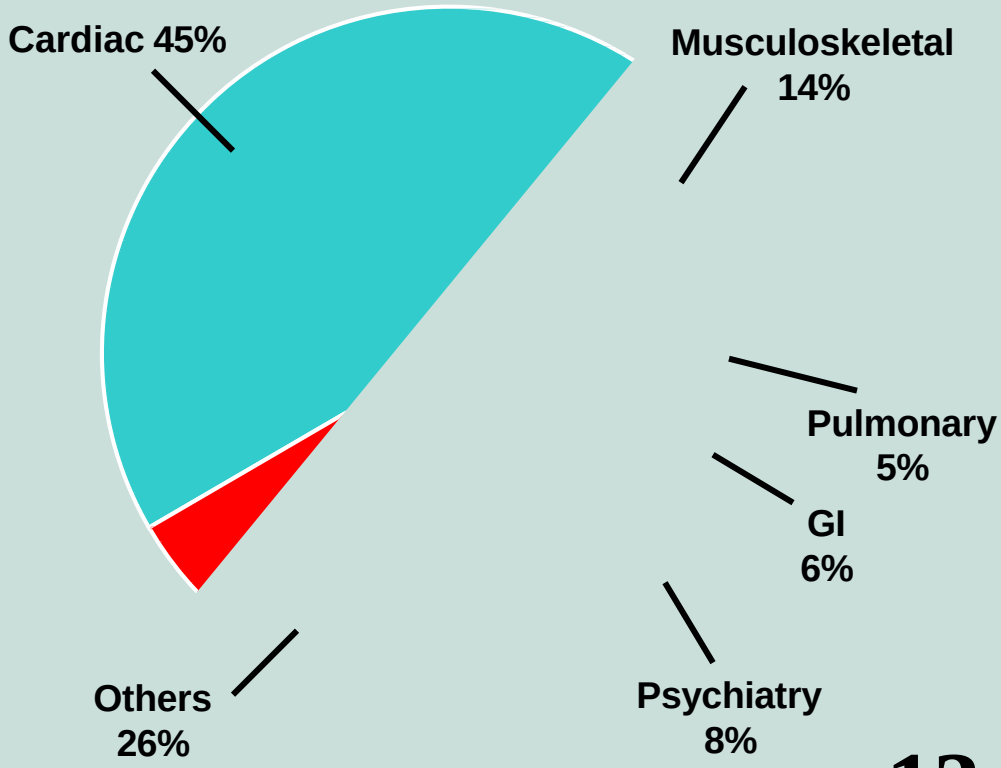


Evaluation of Angina

1. **History:** Ddx of chest pain, risk factors for CAD
2. **PE:** Look for aortic stenosis, HCM, anaemia, thyrotoxicosis, and signs of hyperlipidaemia
3. **Ix:** Baseline and risk factors assessment, functional and/or anatomical tests for CAD
4. In pts with severe angina or unstable angina, may directly proceed to coronary angiogram

Typical Angina : Prognostic factors

Prognostic factors :

1. **Left ventricular function :**

   Symptoms and signs of HF, pulmonary oedema, ECG old infarct

2. **Severity of angina :**

   Recent onset

   Unstable

   “Strongly” positive treadmill test

   Thallium measured large or multiple defects and ↓ ejection fraction (EF) on exercise

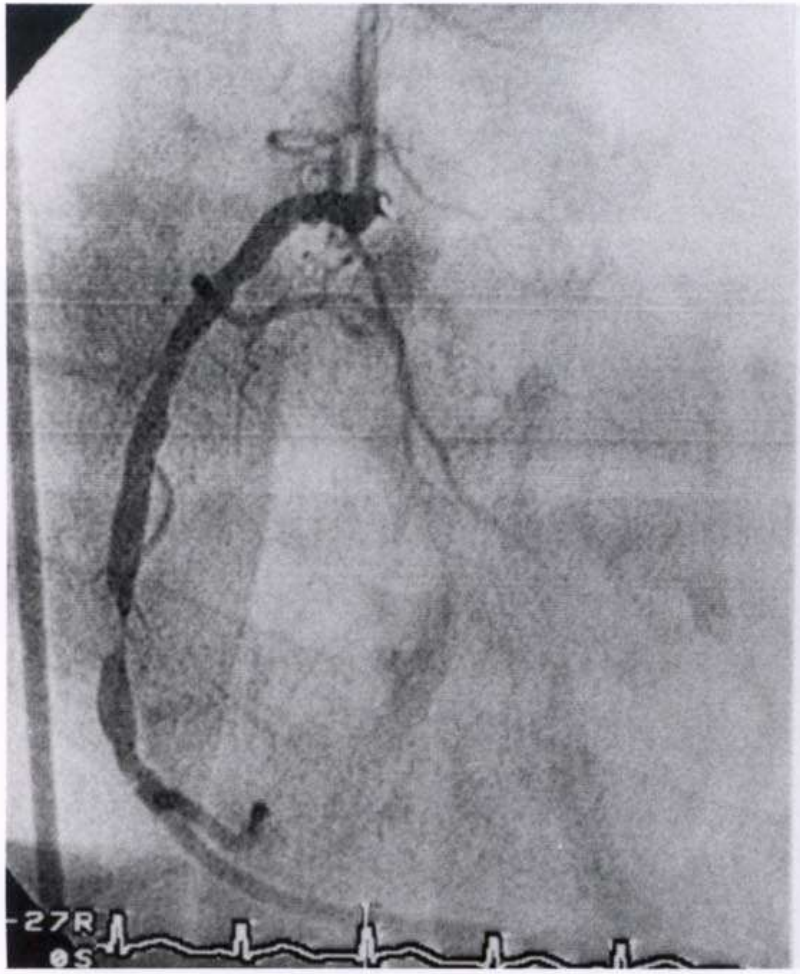
3. **Extent of CAD:**

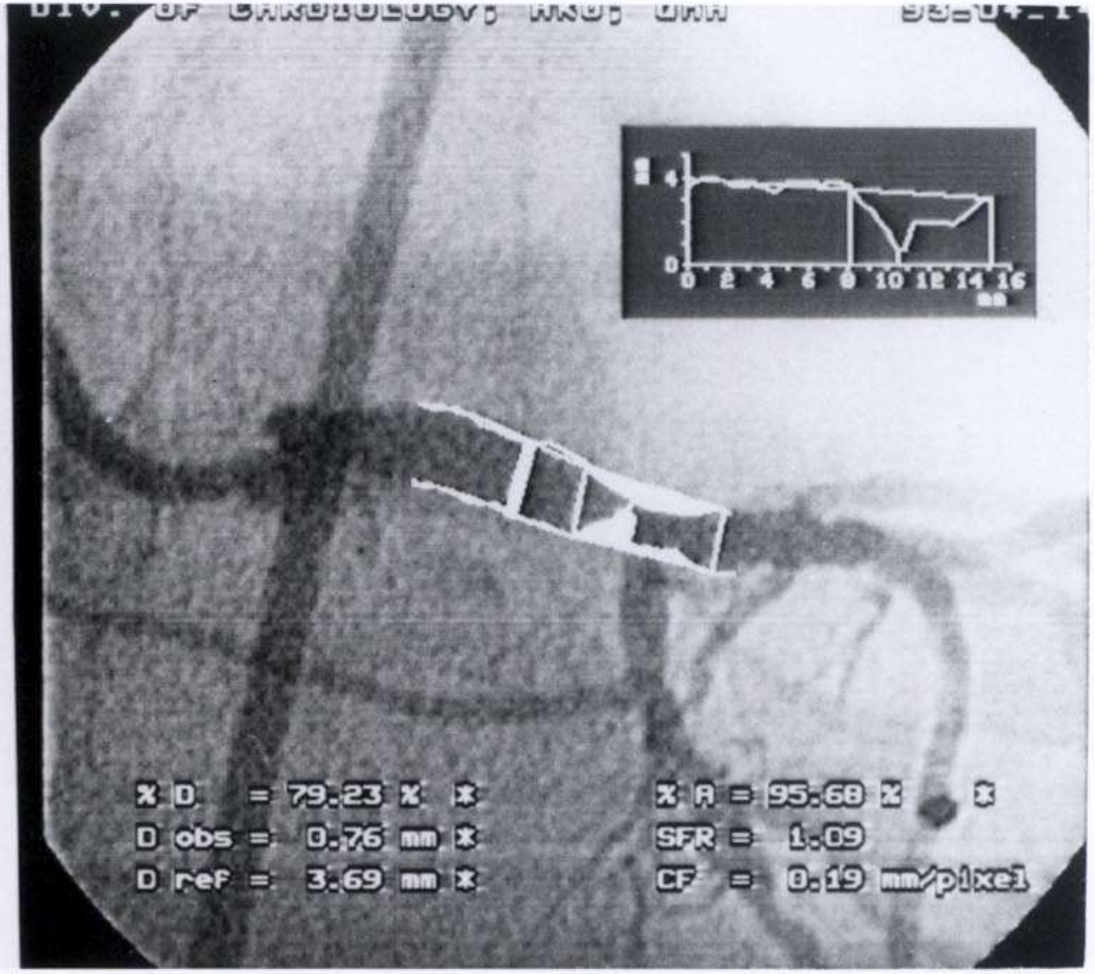
   5 yr Mortality : 1 VD, 2 VD, 3 VD, LMS

   2, 8, 11, 15%/yr

   Poor left ventricular function (low EF, N > 55%) : worsens prognosis

RCA **LMS**




0 2 4 6 8 10 12 14 16
% D = 79.23 %
D obs = 0.76 mm
D ref = 3.69 mm
% A = 95.68 %
SFR = 1.09
CF = 0.19 mm/pixel

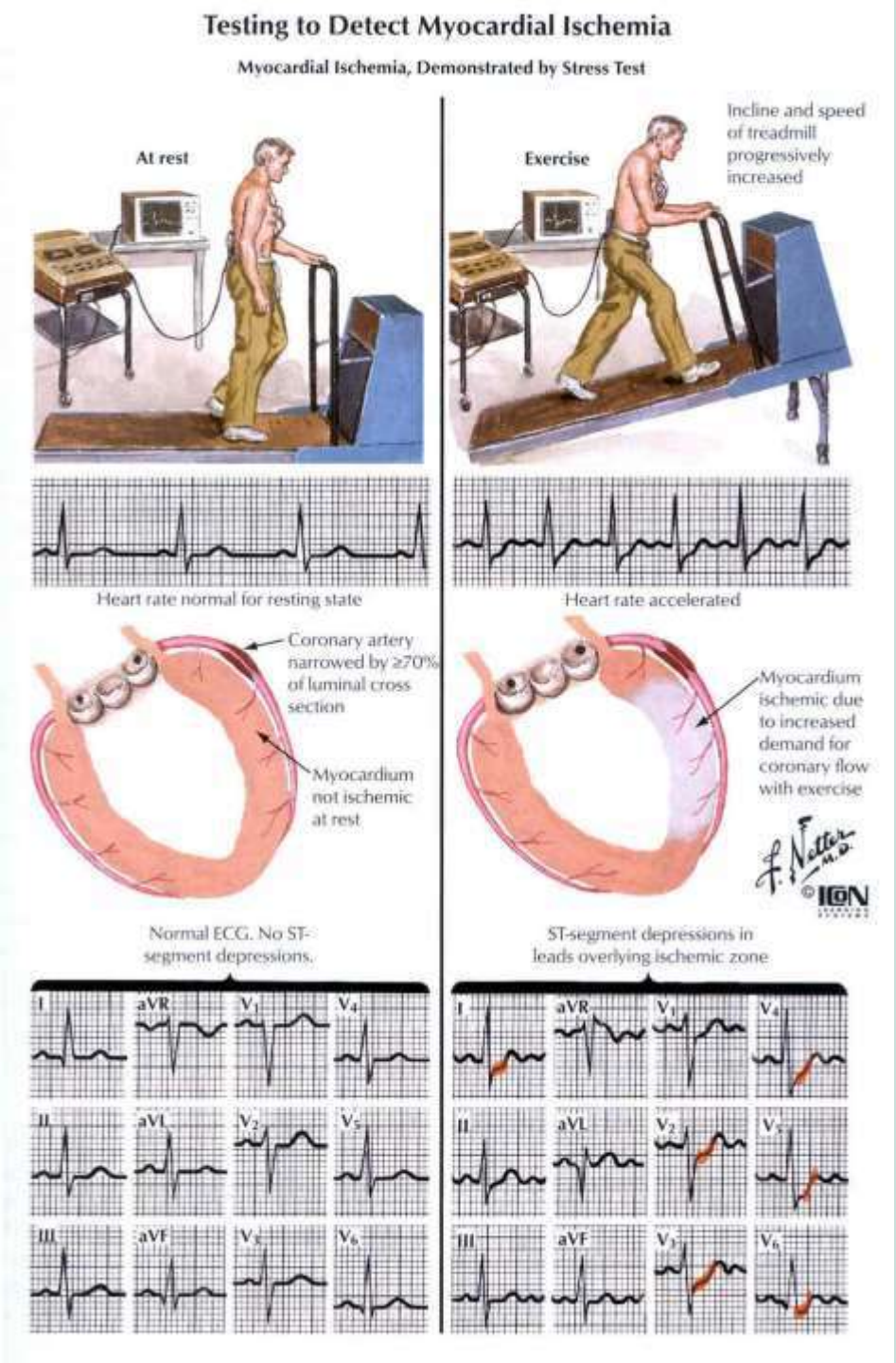
Non-invasive Assessment of CAD

Functional

- Exercise test
- Thallium / sestamibi scan
- Stress echocardiograpy
- MRI
- PET

Anatomical

- Coronary calcification score
- Multidetector computed tomography (CT) coronary angiogram



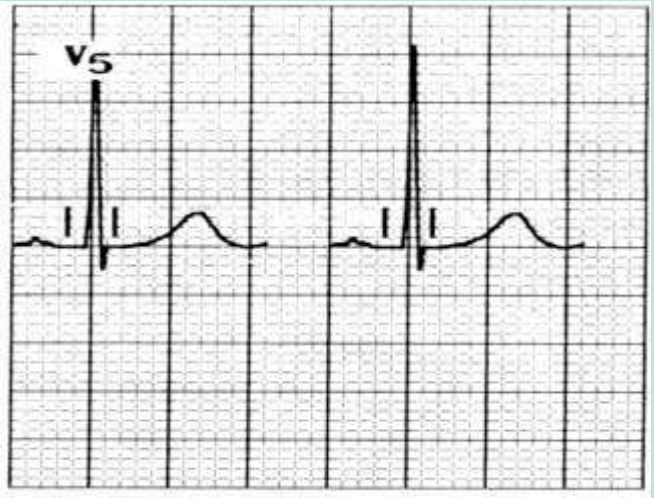
Advantages:

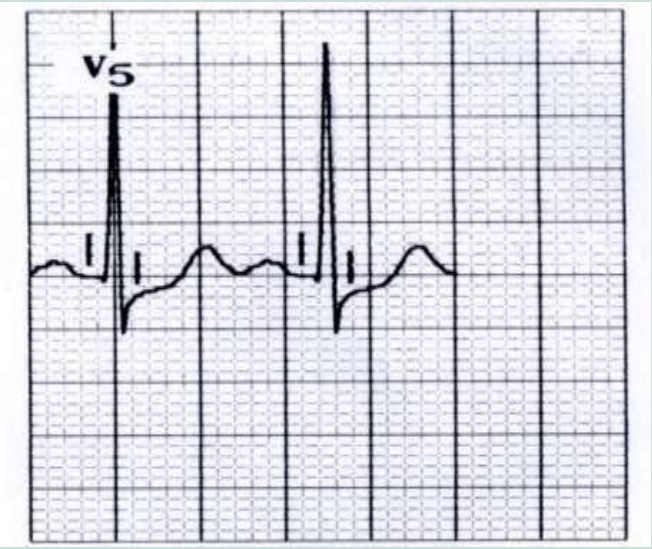
Simple, assess exercise capacity and prognosis.
Sensitivity 65%
Specificity 70%

Limitations:

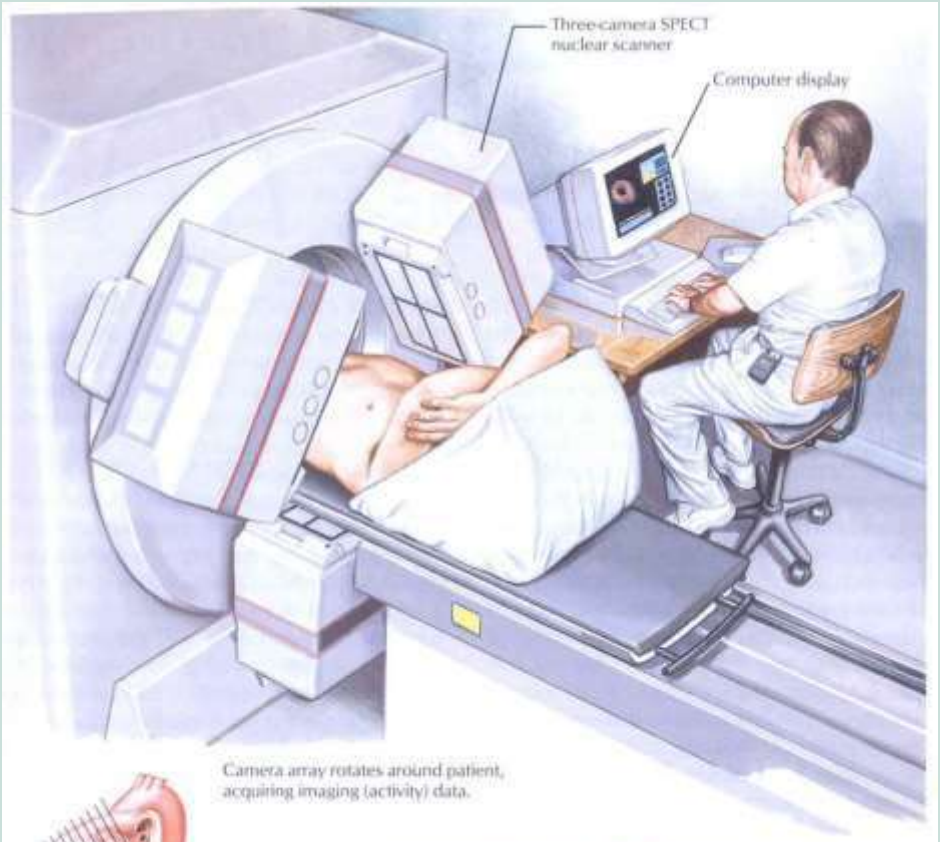
Cannot be used in pts with abnormal baseline ECG or to localised ischaemia

Strongly Positive Exercise Test



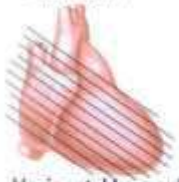


1. **Bruce stage I (low workload) ST > 0.1 mV**
2. **ST > 0.2 mV at any stage**
3. **↓ST persisted for >5 minute on recovery**
4. **↓SBP > 10mmHg**
5. **Annual mortality 5%**



Camera array rotates around patient, acquiring imaging (activity) data.

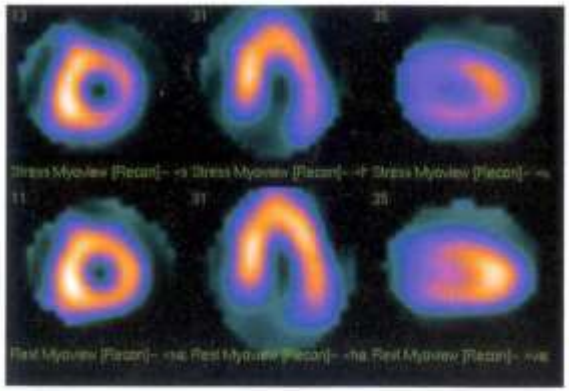
Short axis



Horizontal long axis

Vertical long axis

JOHN A. CRAIG, M.D.
C. Machado, M.D.
©ION



Computer reconstructs acquired image data into a series of tomographic slices displayed in three standard views: short axis, horizontal long axis, and vertical long axis.

Multidetector CT Coronary Angiogram

- 64-320 slices fast CT of coronary arteries, good sensitivity and specificity
- Calcium score: 0 = very low risk of CAD if over 50 yrs, > 100 units significant
- Profile coronaries after venous contrast injection
- Side effects: radiation, contrast
- Triple rule out: CT coronaries, Aortic dissection, pulmonary angiogram together

DFOV 16.9 cm
STND Ph:40% (No Filt.)
505/3
R
A
S
R.CA
L
P
I
25.9/MIP
kv 120
mA Mod.
Rot 0.35s/CH 9.2mm/rot
0.6mm 0.23:1/0.6sp
Tilt: 0.0
03:21:10 PM
W = 738 L = 283
IRA

FOV 11.2cm
TND Ph:75%
RCA
R
7/MIP
120
A N/A
ot 0.35s/CH 10.4mm/rot

Angina Pectoris

A. Medical Treatment

1. Non-drug treatment
2. Drug treatment
   - Aspirin and other platelet inhibitors
   - Lipid lowering therapy
   - Angiotensin converting enzyme inhibitor (ACEI)
   - Angiotensin receptor blocker (ARB)

   prognostic

   - Beta-blocker
   - Nitrate
   - Calcium channel blocker

   symptomatic

   - Newer drugs

B. Revascularisation

- PTCA
- CABG

Non-pharmacological Management

Stop smoking

Alteration of life style

Avoid competitive sport

Treatment of precipitating factors :

High output states,(e.g. anaemia, ↑T4)

Management of other risk factors :

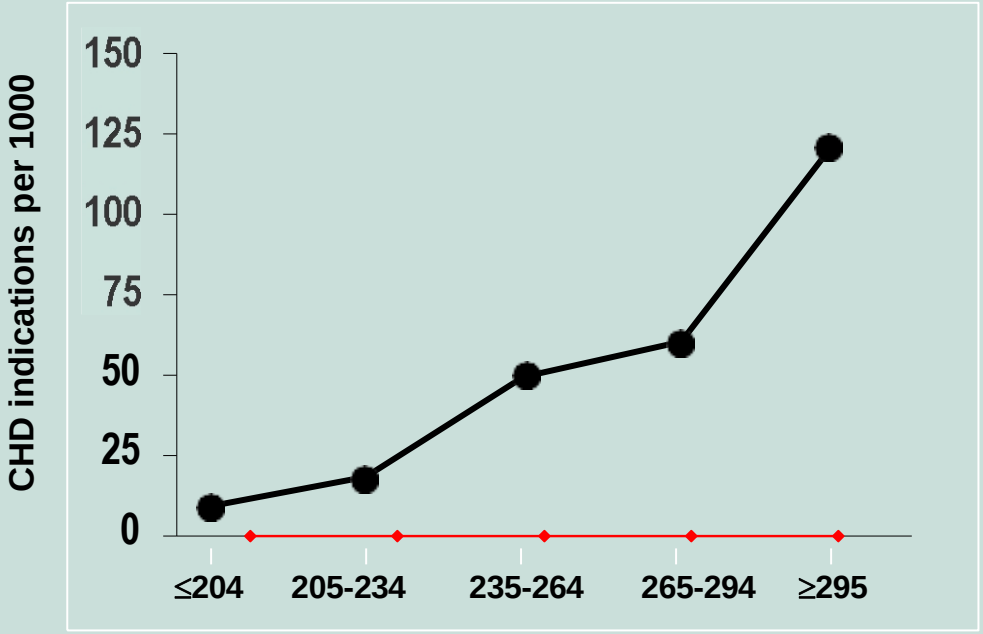
DM, HT, lipids

Drug Treatment

Direct action on CAD: Prognostic implication

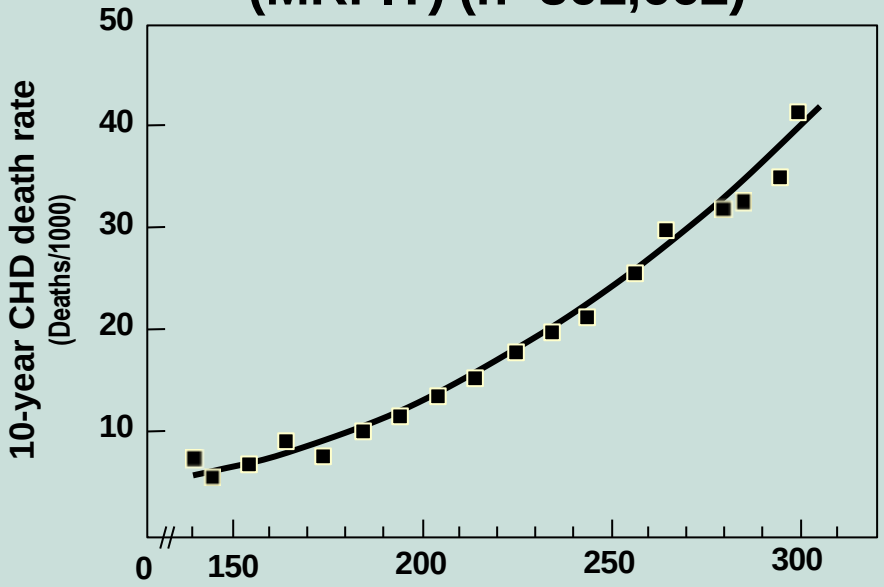
Relationship Between Cholesterol and CHD Risk: Epidemiologic Trials

Framingham Study (n=5209)



Each 1% increase in total cholesterol level is associated with a 2% increase in CHD risk

Multiple Risk Factor Intervention Trial (MRFIT) (n=361,662)

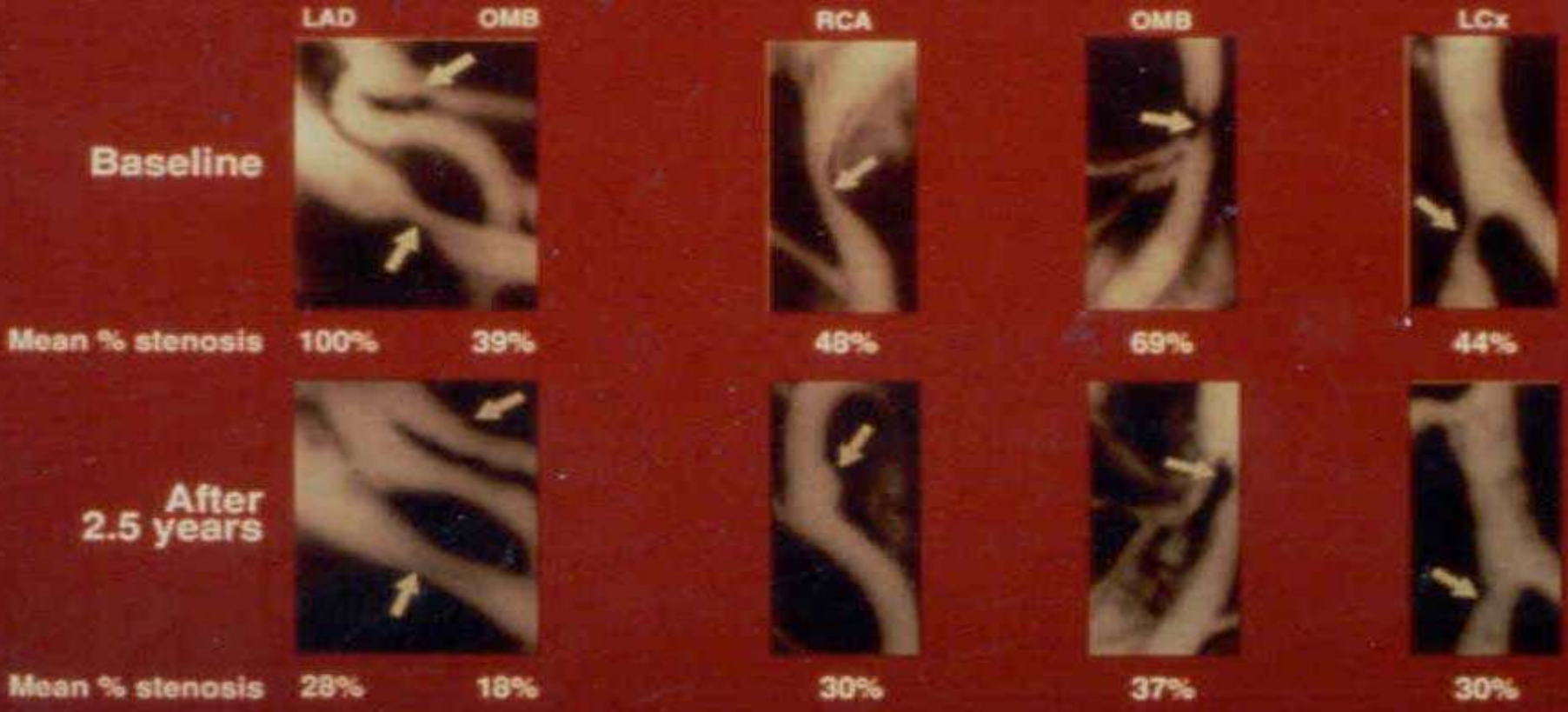


1% reduction in total cholesterol resulted in a 2% decrease in CHD risk

Gotto AM Jr, et al. *Circulation.* 1990;81:1721-1733.

Castelli WP. *Am J Med.* 1984;76:4-12.

Regression of Coronary Artery Disease: FATS



Adapted from Brown G et al *N Engl J Med 323(19)*:1289–1298, 1990

UPDATES : LDL Cholesterol Goals and Cutpoints for Therapeutic Lifestyle Changes (TLC) and Drug Therapy in Different Risk Categories

Risk Category	LDL Goal (mmol/L)	LDL Level at Which to Initiate Therapeutic Lifestyle Changes (TLC) (mmol/L)	LDL Level at Which to Consider Drug Therapy (mmol/L)
CHD or CHD Risk Equivalents (10-year risk >20%)	<1.8	≥2.59	≥3.36 (2.59–3.35: drug optional)
2+ Risk Factors (10-year risk ≤20%)	<3.36	≥3.36	10-year risk 10–20%:>2.59-3.4
			10-year risk <10%: ≥4.14
0–1 Risk Factor	<4.14	≥4.14	≥4.91 (4.14–4.91: LDL-lowering drug optional)

Medications for Lipid Control

- Statins
- Fibrates
- Ezetimide
- Long acting nicotinic acid (raises HDL)

Other Risk Factors Control

- **Diabetes: tight glucose control improves microvascular complications (DM is a CAD equivalent)**
- **Lipid: reduce LDL cholesterol < 1.8 mmol/l with diet and statins**
- **HT: aim at <130/80 (CAD+DM): ACEI/ARB if tolerated**
- **Aspirin: all CAD**
- **↓ hs CRP**

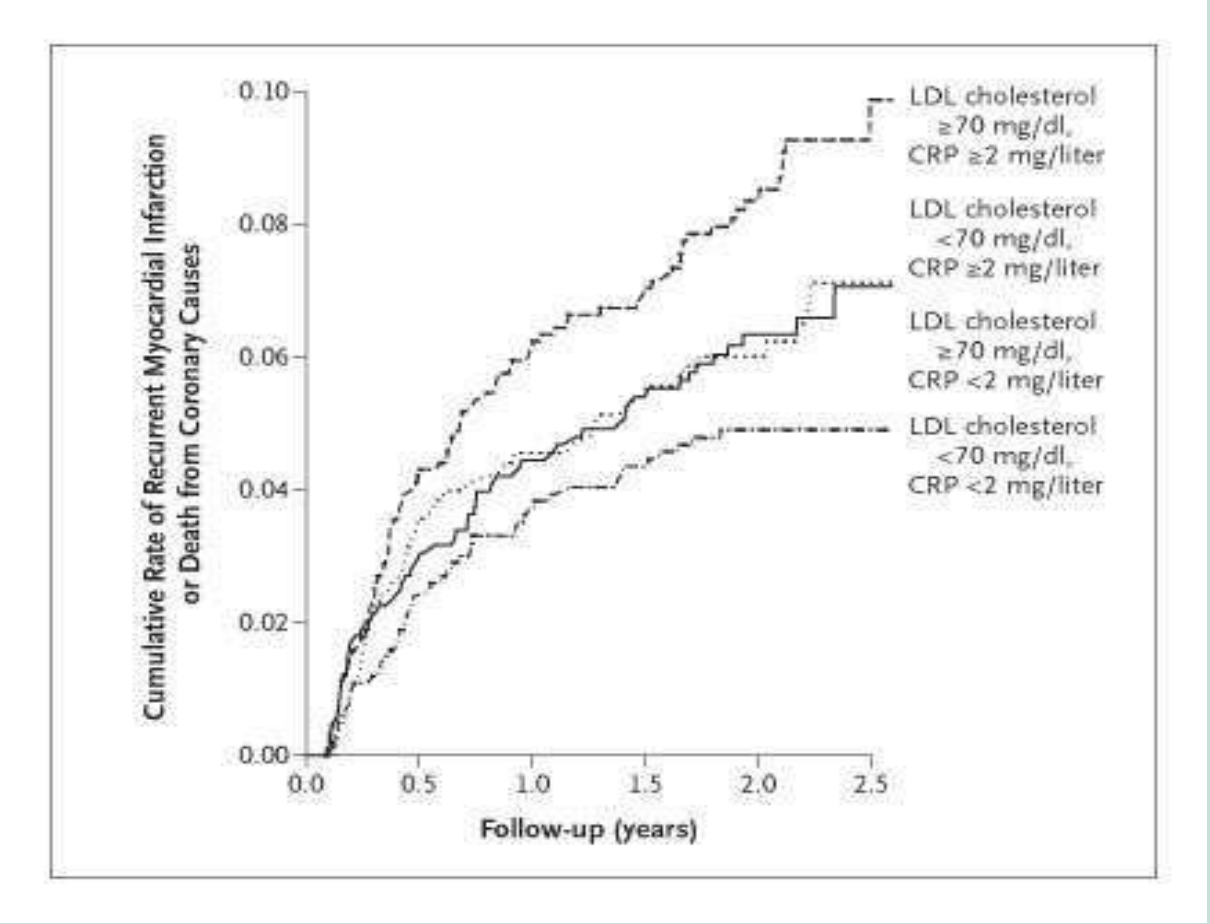
CRP & Statins

Ridker PM et al N Engl J Med 2005; 352:20-28 (2)

Conclusions

In pts with ACS :

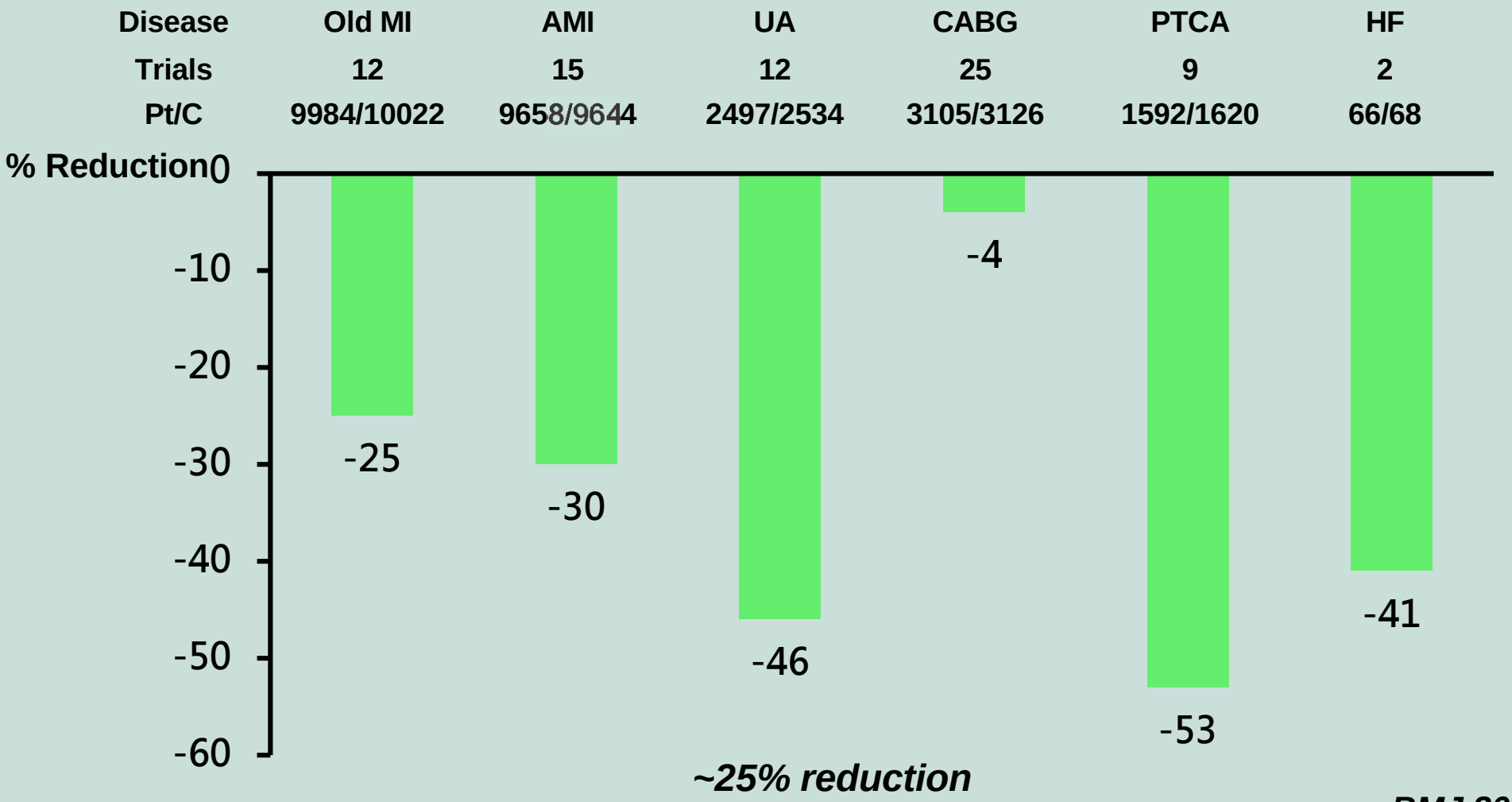
- **CRP <2mg/l is associated with similar risk reduction as LDLC <70mg/dL (1.8mmol/l)**
- **Pts with LDLC <1.8mmol/l and CRP <1mg/l had low event rate (1.9/100 person-yrs)**
- **The benefits after achieving these targets are independent of the type of statins**



Aspirin and Thienopyridine Antagonist

1. Aspirin blocks cyclooxygenase dependent platelet activation
2. It is useful for both primary and secondary prevention of CAD
3. Thienopyridine antagonists (e.g. clopidogrel, ticlopidine) block ADP dependant platelet aggregation, work synergistic with aspirin (esp. in coronary stenting and acute coronary syndrome)

Coronary Artery Disease



~25% reduction

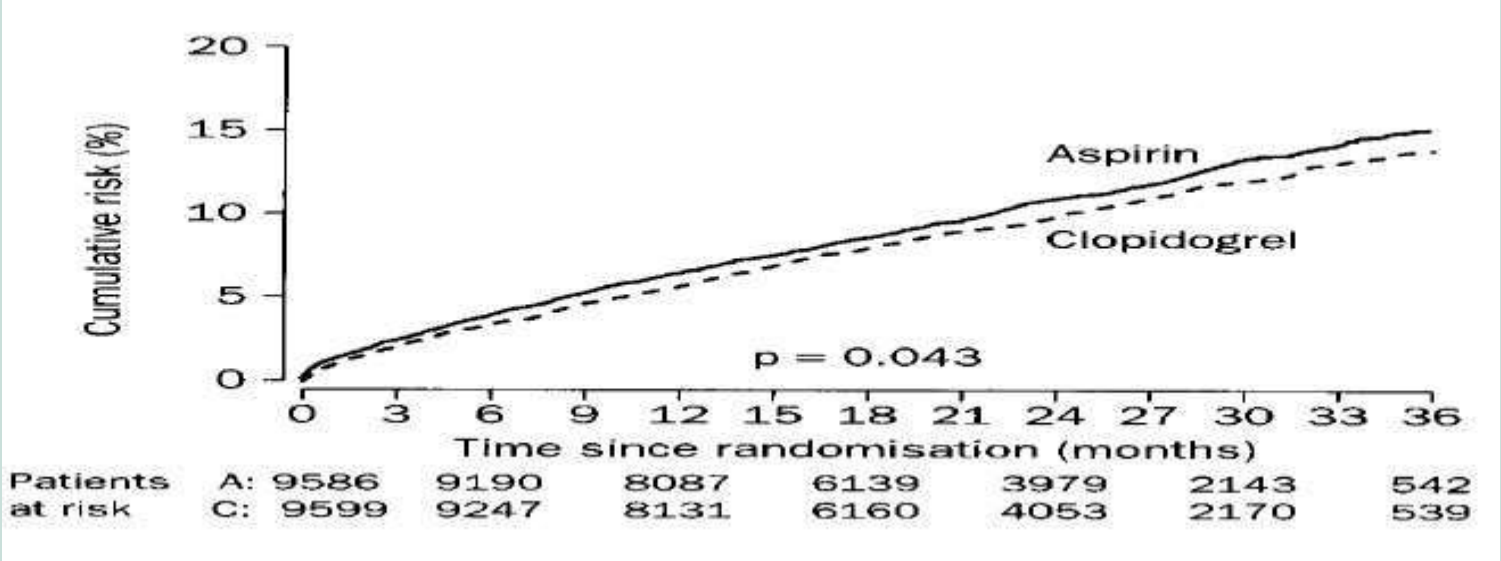
BMJ 2002

Are Antiplatelet Agents Different in Stable CAD?
Clopidogrel Vs ASA (CAPRIE Trial)

Background : Indirect comparison of trials showed no significant difference between ASA and other antiplatelet therapy

Methods : 19185 pts with history of MI, CVA or PVD received either clopidogrel or ASA for 3 years

Results :



Conclusion : Clopidogrel reduces major vascular events by 8.7% (0.3-16.5%) but difference are small and are mainly seen in pts with PVD
Clopidogrel has a lower risk of severe GIB (0.71 vs 0.49%)

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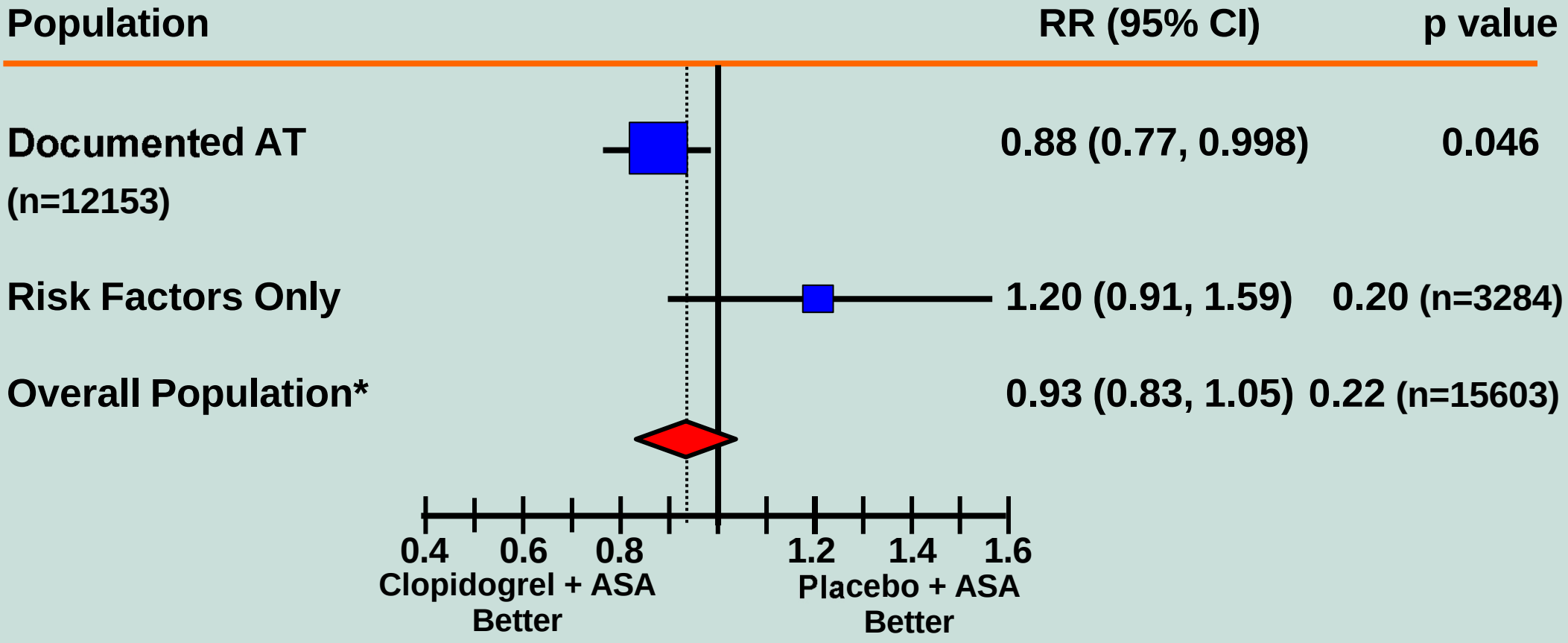
CHARISMA : Primary Efficacy Results of Combined Aspirin+Clopidogrel (MI/Stroke/CV Death) by Pre-Specified Entry Category



* A statistical test for interaction showed marginally significant heterogeneity (p=0.045) in treatment response for the pre-specified subgroups of symptomatic and asymptomatic patients
AT=Atherothrombosis

Adapted from Bhatt DL, Fox KA, Hacke W, et al. *NEJM* 2006

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