بسم الله الرحمن الرحيم

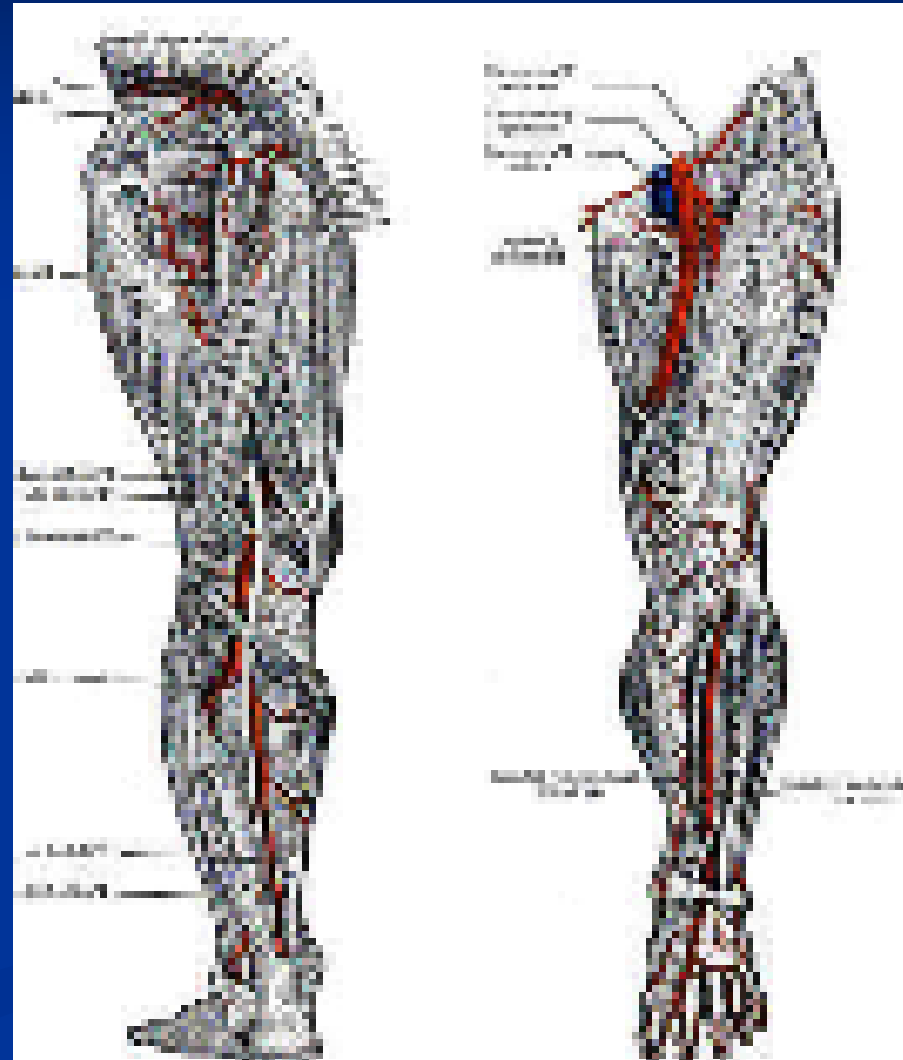# Peripheral Arterial disease

A Marker For CAD

By

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Definition

- The presence of a stenosis or occlusion in the aorta or arteries of the limbs.
- It is usually caused by atherosclerosis.
- PAD is associated with an increased risk of cardiovascular and cerebrovascular events, including death, MI and stroke

Prevalence of PAD – variation according to diagnostic criterion

- **6.3 million individuals with symptomatic, established PAD are diagnosed in the USA and EU[1]**

- **Epidemiological studies imply that real* prevalence may be approx. 20 million** *(= 9.5% of the population > 50 years old)*

- **In 613 men and women** *(mean age 66 years)***, real prevalence was found to be underestimated by two- to seven-fold[2]**

- **ABPI** *(ankle:brachial pressure index)* **correlates with angiographically determined disease[3]**

- **ABPI < 0.9 is a marker of diffuse atherothrombosis[4]**

[1] 17 Western European countries. Statistical Supplement; WHO Yearbooks, Annual Statistics, 1997;

[2] Criqui MH et al. Vasc Med 1997;2:221–226; [3]Shinozaki T et al. J Clin Epidemiol 1998;15:1263–1269; [4]Kornitzer M et al. Angiology 1995;46:211–219.

*ABPI < 0.9, symptomatic or not, diagnosed or not.

PARTNERS Program: Prevalence of PAD and CVD in Community Practices

29% of patients were diagnosed with PAD using ankle-brachial index

29%

44%

56%

- Patients diagnosed with PAD
- PAD only
- PAD and CAD

Hirsch AT et al. JAMA. 2001;286:1317-1324.
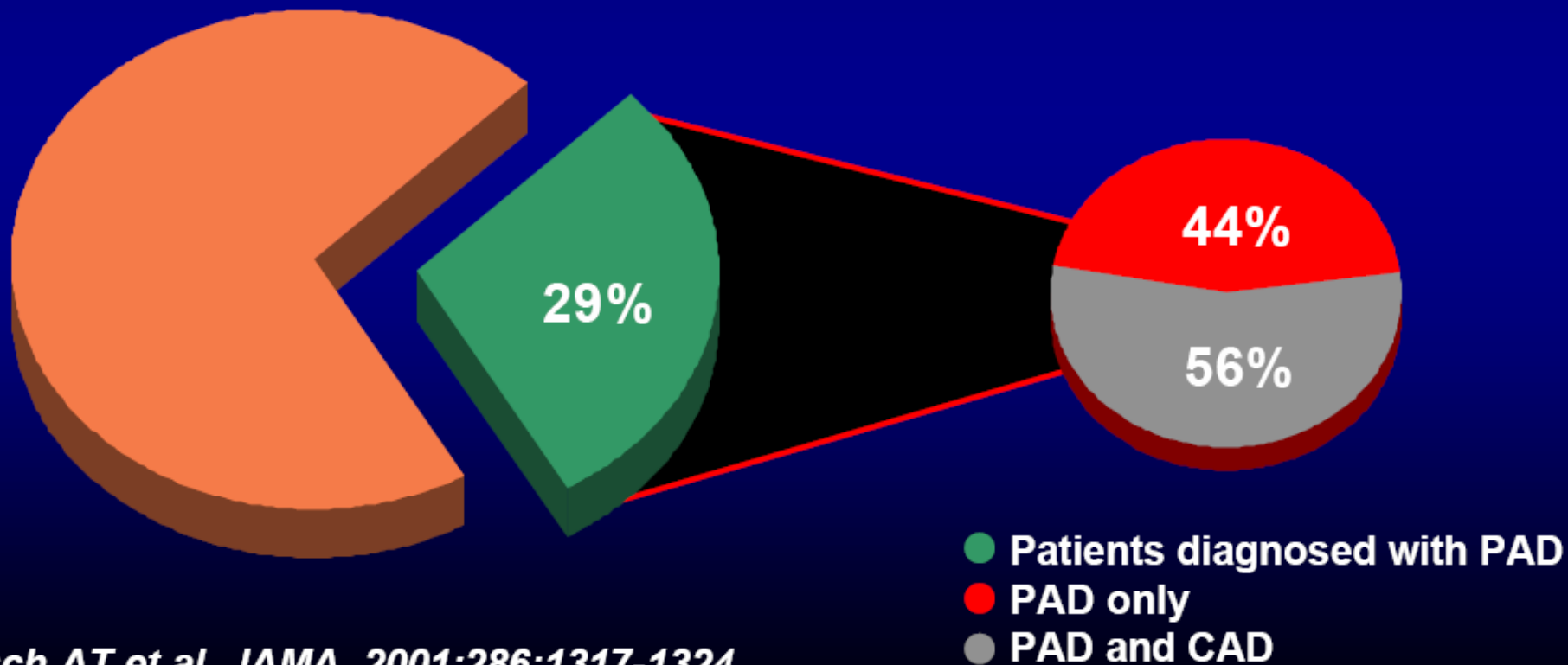
Epidemiology of PAD – effect of age and gender

- **Epidemiological data on PAD vary according to:**
    - *Population studied*
    - *Method of diagnosing PAD*

- **Incidence and prevalence of intermittent claudication* increase with age**
    - *Prevalence in men aged 45–50 years is 1%*
    - *Prevalence is 3–3.5% in men aged > 50 years*
    - *Similar trend in women, increase with age*

- **More common in men than in women**
    - *Twice as many men as women aged > 50 years have intermittent claudication (3.5% and 2%, respectively)*

- **Predominance in males disappears after age of 70**

Weitz JI et al. Circulation 1996;94:3026–3049.   ** Rose questionnaire criteria Bull. Wld Hlth Org. 1962;27:645-658*
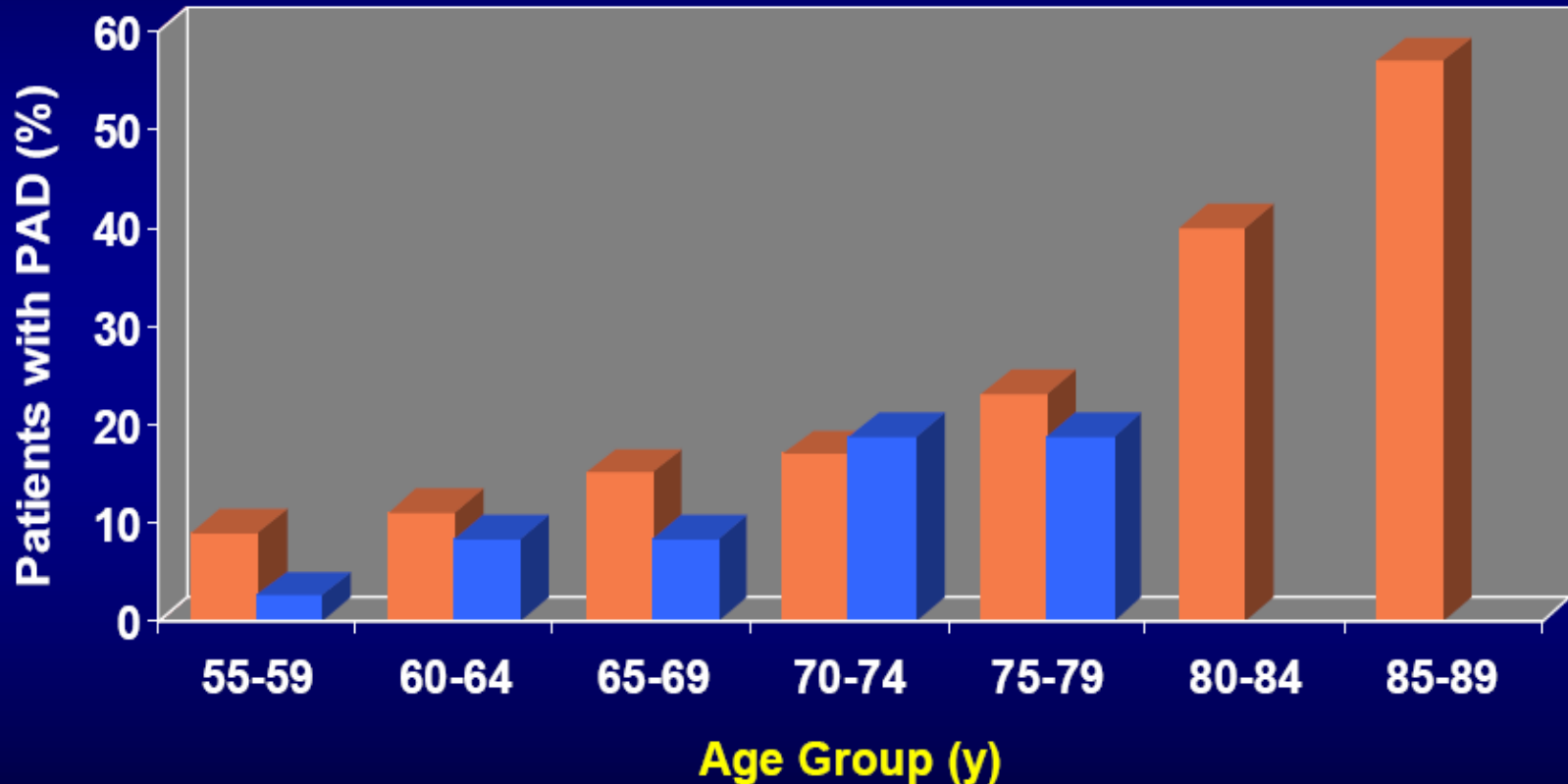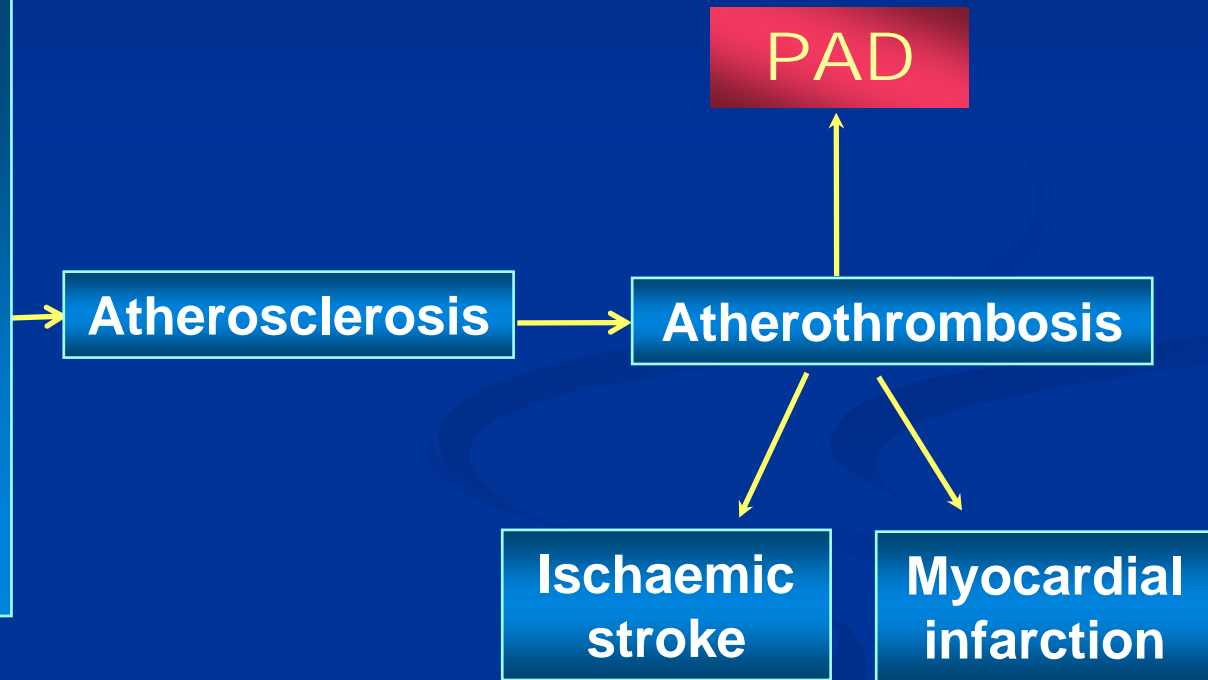
Prevalence of PAD with Age

Figure adapted from Creager M, ed. *Management of Peripheral Arterial Disease. Medical, Surgical and Interventional Aspects.* 2000.

1. Meijer WT et al. *Arterioscler Thromb Vasc Biol.* 1998;18:185-192.
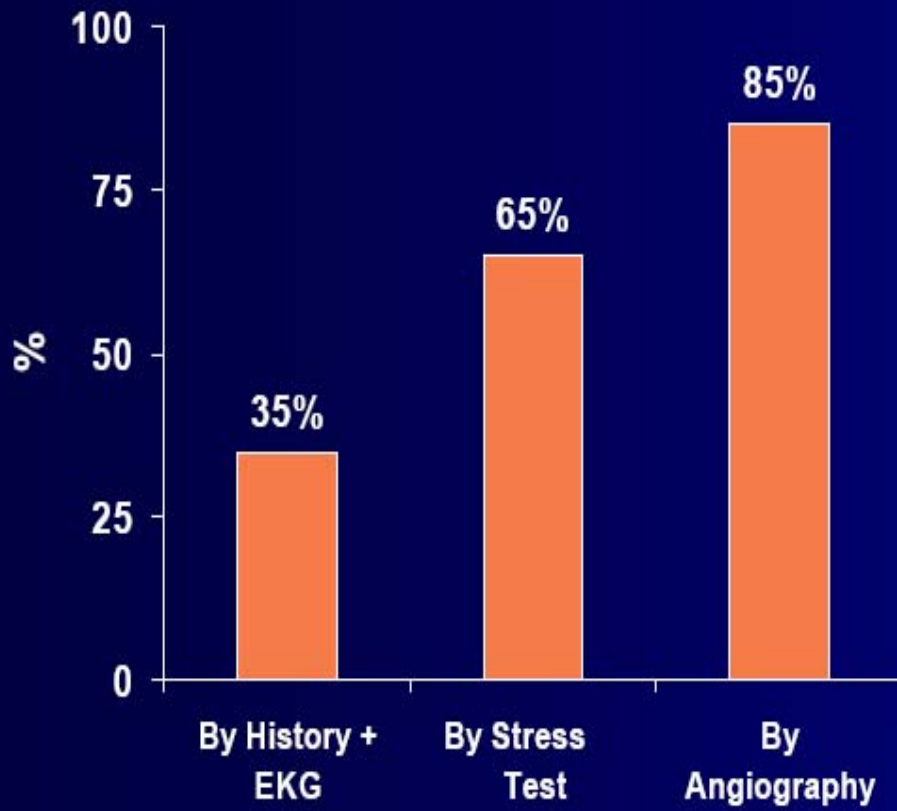2. Criqui MH et al. *Circulation.* 1985;71:510-515.

Risk factors for PAD

- **Gender (male)**
- **Age**
- **Smoking**
- **Hypertension**
- **Diabetes**
- **Hyperlipidaemia**
- **Fibrinogen**
- **Homocysteinaemia**

PAD

Atherosclerosis → **Atherothrombosis**

Ischaemic stroke

Myocardial infarction

Murabito JM et al. Circulation 1997;96:44–49; Laurila A et al. Arterioscler Throm Vasc Biol 1997;17:2910–2913; Malinow MR et al. Circulation 1989;79:1180–1188; Brigden ML. Postgrad Med 1997;101:249–262.

CAD & CVD in Patients with PAD

Coronary Heart Disease

- By History + EKG: 35%
- By Stress Test: 65%
- By Angiography: 85%

Cerebrovascular Disease

- By History: 5%
- Stenosis >70% by Duplex: 25%
- By Cervical Bruit: 45%
- Stenosis >30% by Duplex: 60%
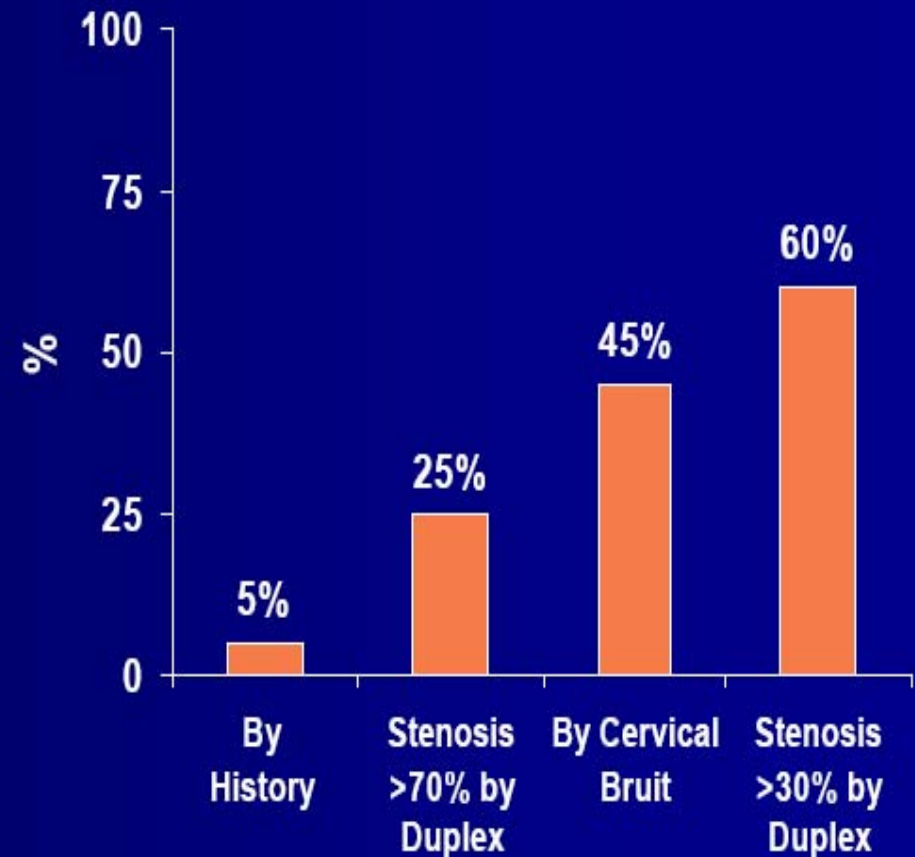
Atherothrombosis – coexistence of symptomatic PAD and coronary or cerebrovascular disease

Concurrent cardiovascular disease (MI, CABG, stroke or stroke surgery)

Criqui MH et al. Vasc Med 1997;2:221–226.
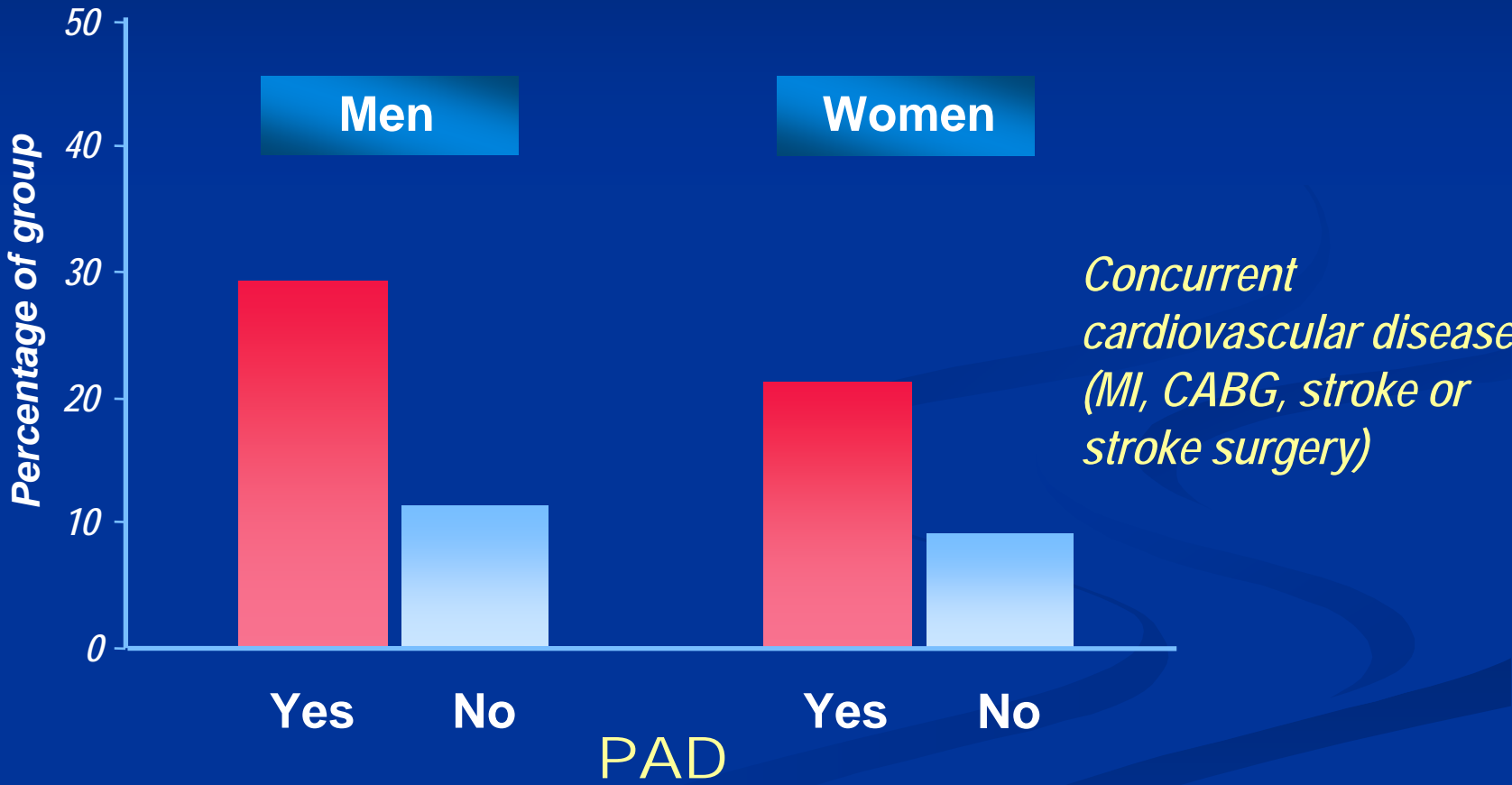
Atherothrombosis – symptomatic atherosclerosis in CAPRIE
(overlap between PAD, CAD and CVD)

CAPRIE[1] (*n* = 19185)

Cerebrovascular disease (CVD)

Coronary artery disease (CAD)

24.6%

7.3%

29.9%

3.3%

3.8%

11.9%

19.2%

Peripheral Arterial Disease (PAD)
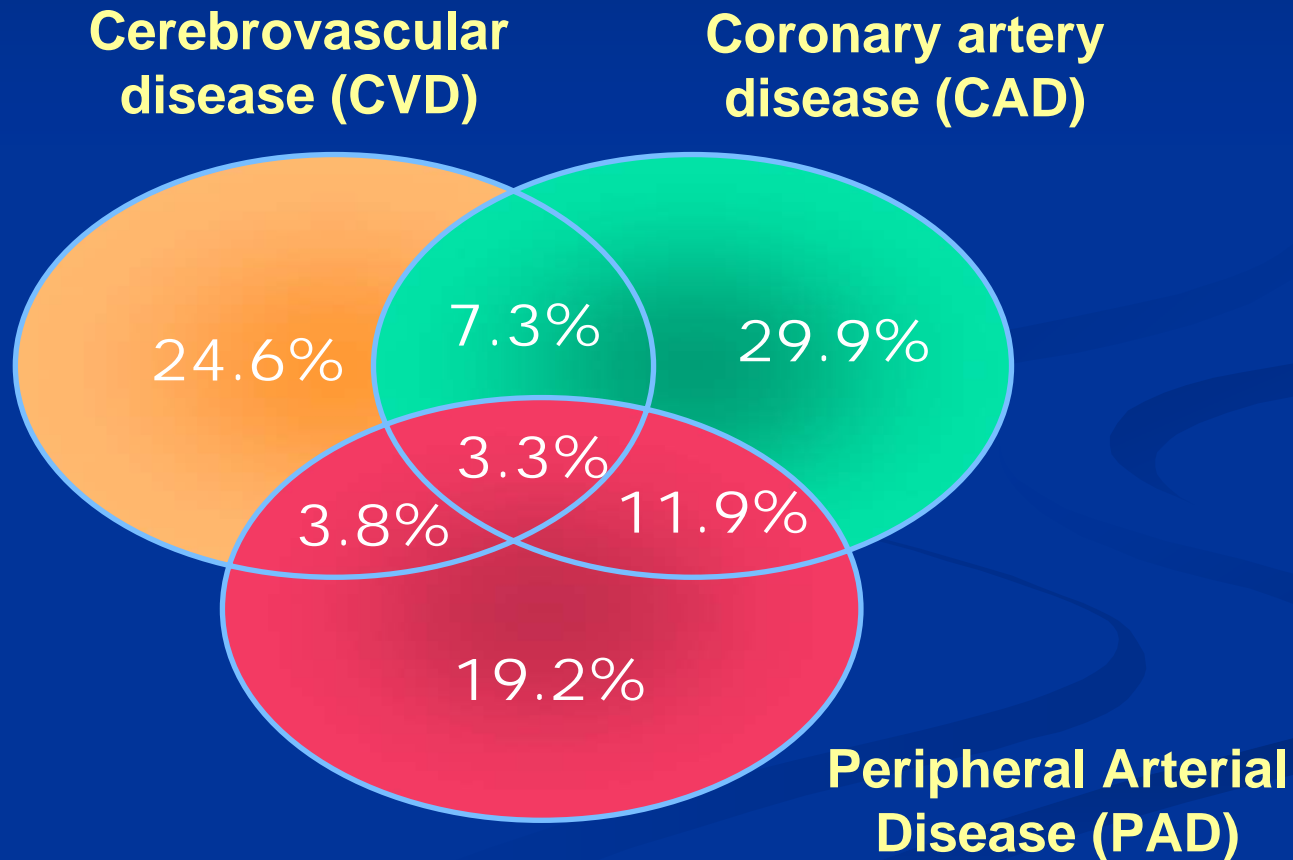
[1]CAPRIE Steering Committee. Lancet 1996;348:1329–1339.

PAD Clinical Presentations

	Asymptomatic	Claudication	Critical Leg Ischemia
Diagnosis	ABI ? 0.9	Muscle pain, ache, cramps, numbness, fatigue with walking	Pain at rest, ischemic ulceration, gangrene
Prevalence	>50% 4-6 million	30-35% 2-4 million	<10% 400,000-1 million

Hiatt WR. N Engl J Med. 2001;344:1608-1621.

Symptomatology of PAD

- Intermittent claudication

  - Exercise-induced ischaemic calf-muscle pain while walking and/or weakness, relieved by rest

  - Mortality rate from stroke and MI two to three times greater than in age-matched controls[1]

  - Prognosis varies with multiple risk factors and/or severity of disease

Symptomatology of PAD

■ **Critical limb ischaemia**

■ Pain at rest, eventually resulting in gangrene and amputation[2]

[1]*Dormandy JA et al. J Cardiovasc Surg 1989;30:50–57.*
[2]*European Working Group on Critical Leg Ischemia. Circulation 1991;84(Suppl IV):IV1–IV26.*

Diagnosis of PAD

- Evaluation of pulses and auscultation of bruits

- Ankle:arm blood pressure index (ABPI)
  - Ratio of ankle:brachial systolic blood pressure
  - Simple, non-invasive, suitable for routine screening
  - Sensitivity 95% & Specificity 99%

- Exercise testing
  - Pain-free and maximal walking distance
  - Size and duration of drop in ankle systolic BP upon claudication

Weitz JI et al. Circulation 1996;94:3026–3049.

Ankle Brachial Index (ABI)

$$ABI = \frac{\text{Ankle systolic pressure}}{\text{Brachial systolic pressure}}$$

Using the Ankle-Brachial Index

Above 0.90	Normal
0.71 – 0.90	Mild impairment
0.41 – 0.70	Moderate impairment
0.00 – 0.40	Severe impairment

150 mm Hg
Right Arm
Pressure

160 mm Hg
Left Arm
Pressure

Right ABI
80/160 = 0.50

Left ABI
120/160 = 0.75

Pressure
40 mm Hg PT
80 mm Hg DP
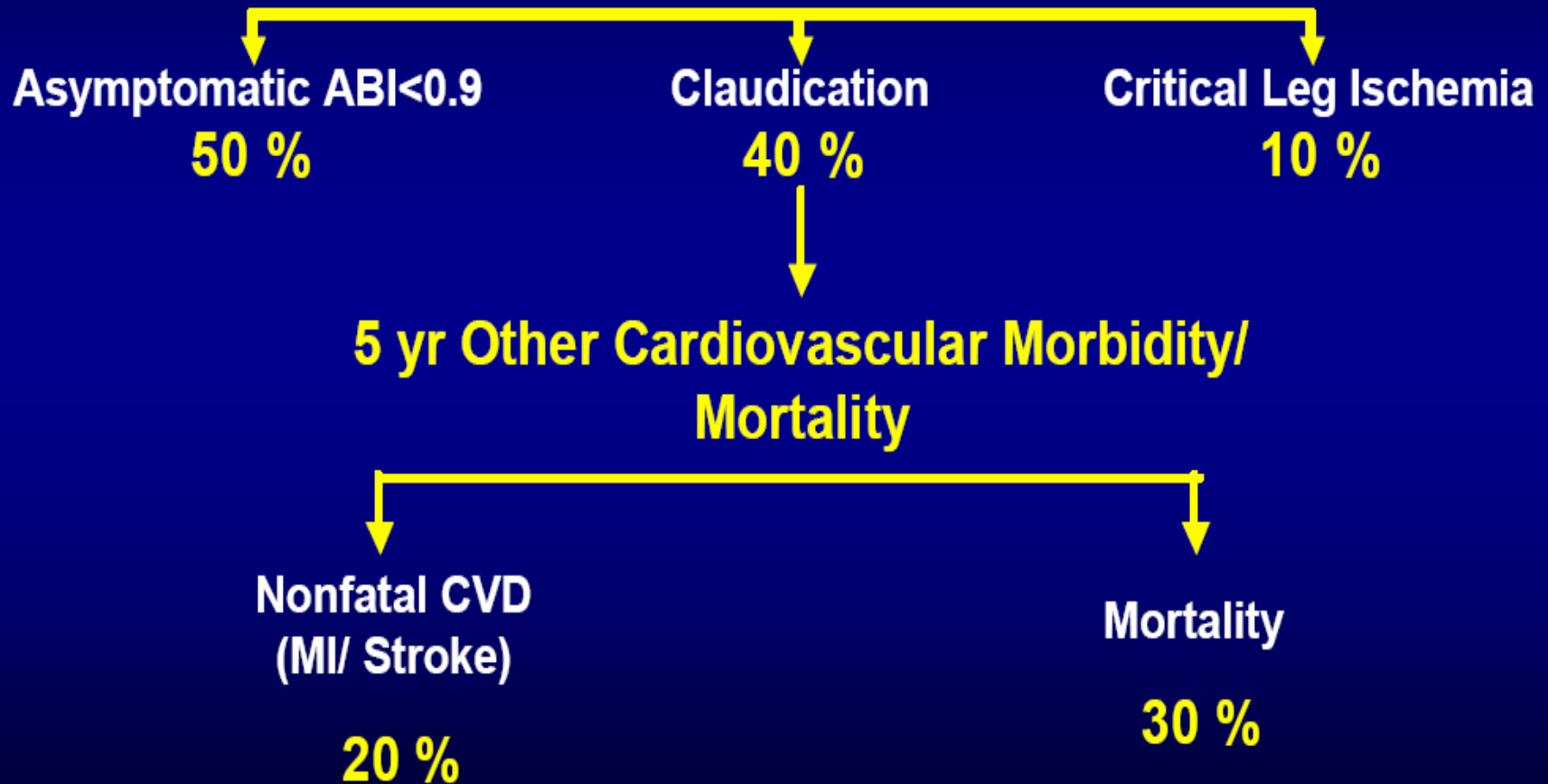
Pressure
120 mm Hg PT
80 mm Hg DP

Non-invasive Vascular Diagnostic Tests

- **Segmental blood pressure recording**

- **Pulse volume recording**

- **Exercise stress testing**

- **Duplex ultrasound**

- **Magnetic resonance angiography**

- **CT angiography**

PAD: Natural History

PAD Population > 55 yrs

Asymptomatic ABI<0.9	Claudication	Critical Leg Ischemia
50 %	40 %	10 %

5 yr Other Cardiovascular Morbidity/ Mortality

Nonfatal CVD (MI/ Stroke)

20 %

Mortality

30 %

PAD: Natural History

PAD Population > 55 yrs

Asymptomatic ABI<0.9	Claudication	Critical Leg Ischemia
50 %	40 %	10 %

5 yr Peripheral Arterial Outcomes

Stable Claudication	Worsening Claudication	Leg Revascularization	Major Amputation
73 %	16%	7%	4%
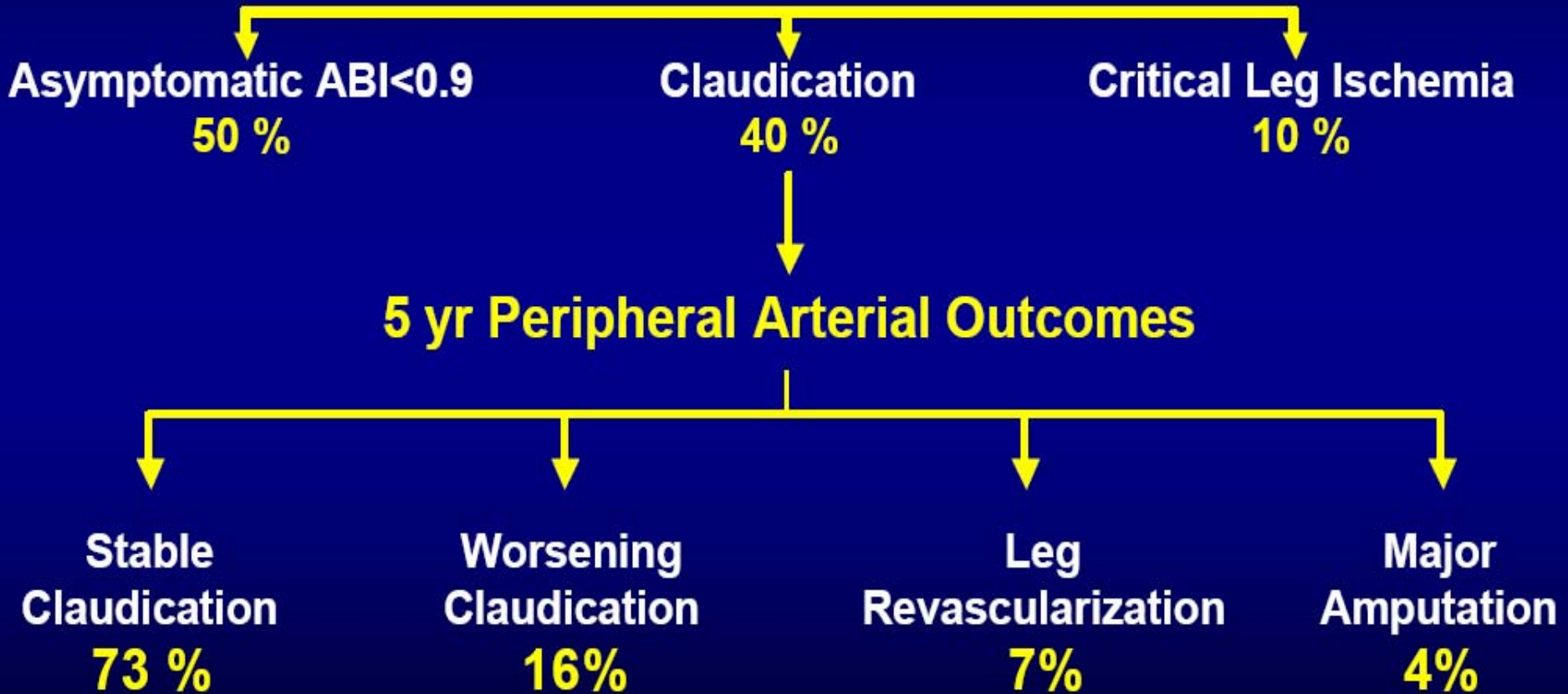
Weitz Jl, Circulation. 1996;94:3026-3049

5-year natural history of PAD

100 patients
with asymptomatic PAD

100 patients
with claudication who do not
seek medical advice

100 patients
diagnosed
with claudication

Local Events

Worsening claudication 25 patients

↓

Surgical revascularization 10 patients

↓

Major amputation 2 patients

Systemic Events

10 to 20 non-fatal MIs or strokes

PLUS

30 deaths:
- CHD 15
- Other cardiovascular and cerebrovascular 5
- Non-cardiovascular 10

Dormandy JA. Hosp Update 1991;April:314–318.

CHD Risk Increases With Decreases in ABI

Y-axis: CHD Event Outcomes* per Year (%)

Bars (ABI categories):
- >1.1
- 1.0–0.91
- 0.9–0.71 — 5-year risk: 10%
- <0.7 — 5-year risk: 19%

ABI

*Fatal or nonfatal MI

Leng Leng GC et al. GC et al. *BMJ BMJ* 1996;313:1440-1444

Low ABPI is a strong predictor of cardiovascular mortality

- Reduced ABPI is a significant independent predictor of cardiovascular and coronary mortality

- Age-adjusted relative risks for 10-year cardiovascular and coronary mortality are higher in those with ABPI < 0.9

- The risk of cardiovascular death increases with decreasing ABPI

Low ABPI is a strong predictor of cardiovascular mortality

- ABPI measurement is underutilized and can be usefully incorporated in risk assessment and screening programmes

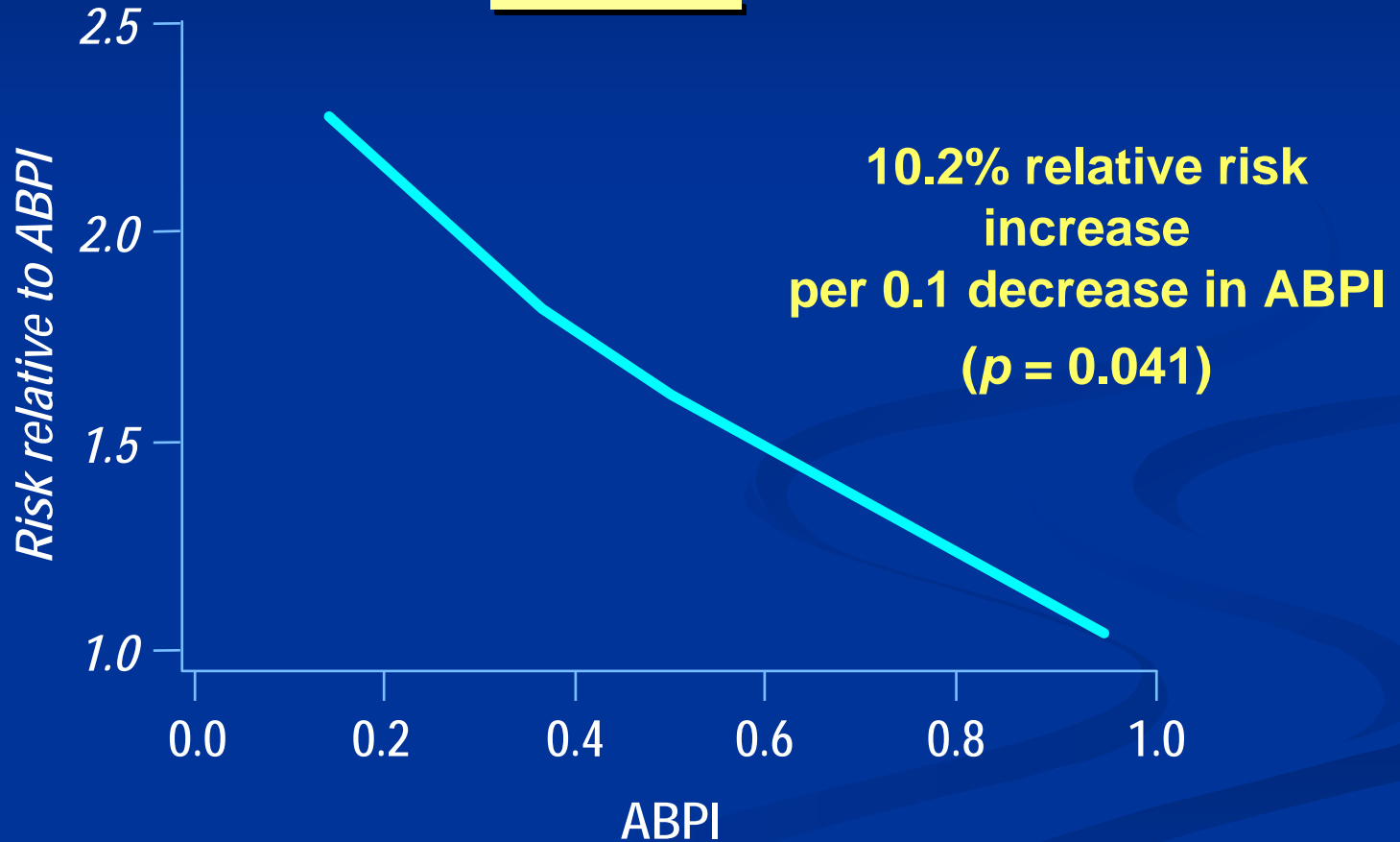- ABPI measurements are inexpensive, simple and non-invasive

Kornitzer M et al. Angiology 1995;46:211–219.   *McKenna M et al. Atherosclerosis 1991;87:119–128.*

*Dormandy JA et al. J Cardiovasc Surg 1989;30:50–57.*

ABPI – inverse relationship with 5-year risk of cardiovascular events and death

10.2% relative risk increase
per 0.1 decrease in ABPI
(p = 0.041)

Dormandy JA, Creager MA. Cerebrovasc Dis 1999;9(Suppl 1):1–128 (Abstr 4).

PAD mortality – 10-year survival rates of subjects in the San Diego Artery Study

*Criqui MH et al. N Engl J Med 1992;326:381–386.*
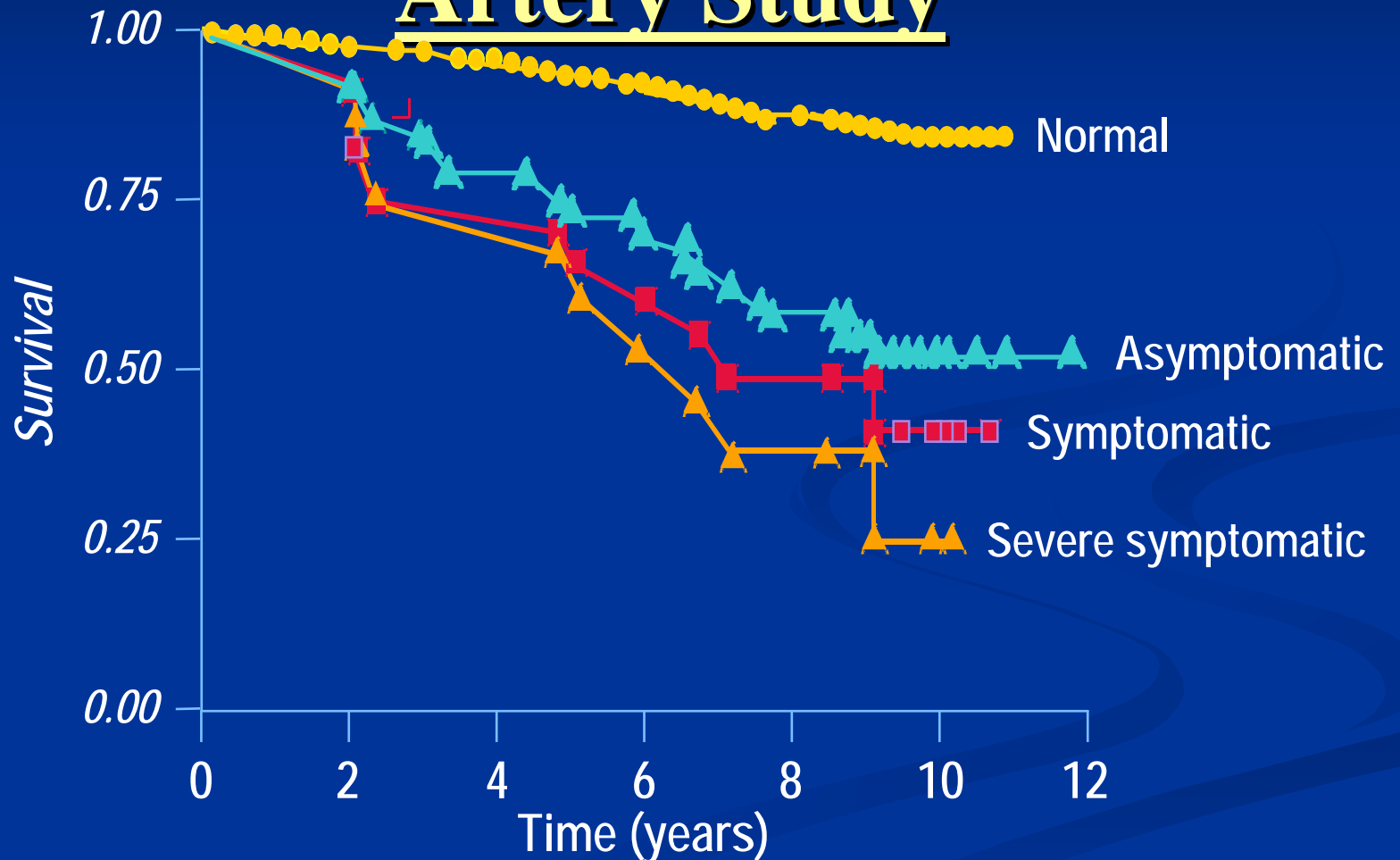
PAD Mangement

- **Symptomatic**
  - **Exercise**
  - **Pharmacologic**
    - **Pentoxifylline**
    - **Cilostazol**
  - **Revascularization**
    - **Catheter based**
    - **surgical**

- **Reduction of ischemic events**
  - **Control of risk factors**
    - **Smoking**
    - **Dyslipidemia**
    - **DM**
    - **HTN**
  - **Antiplatelet therapy**

Effect of Cilostazol vs. Pentoxifylline on Walking Distance in Patients with Claudications
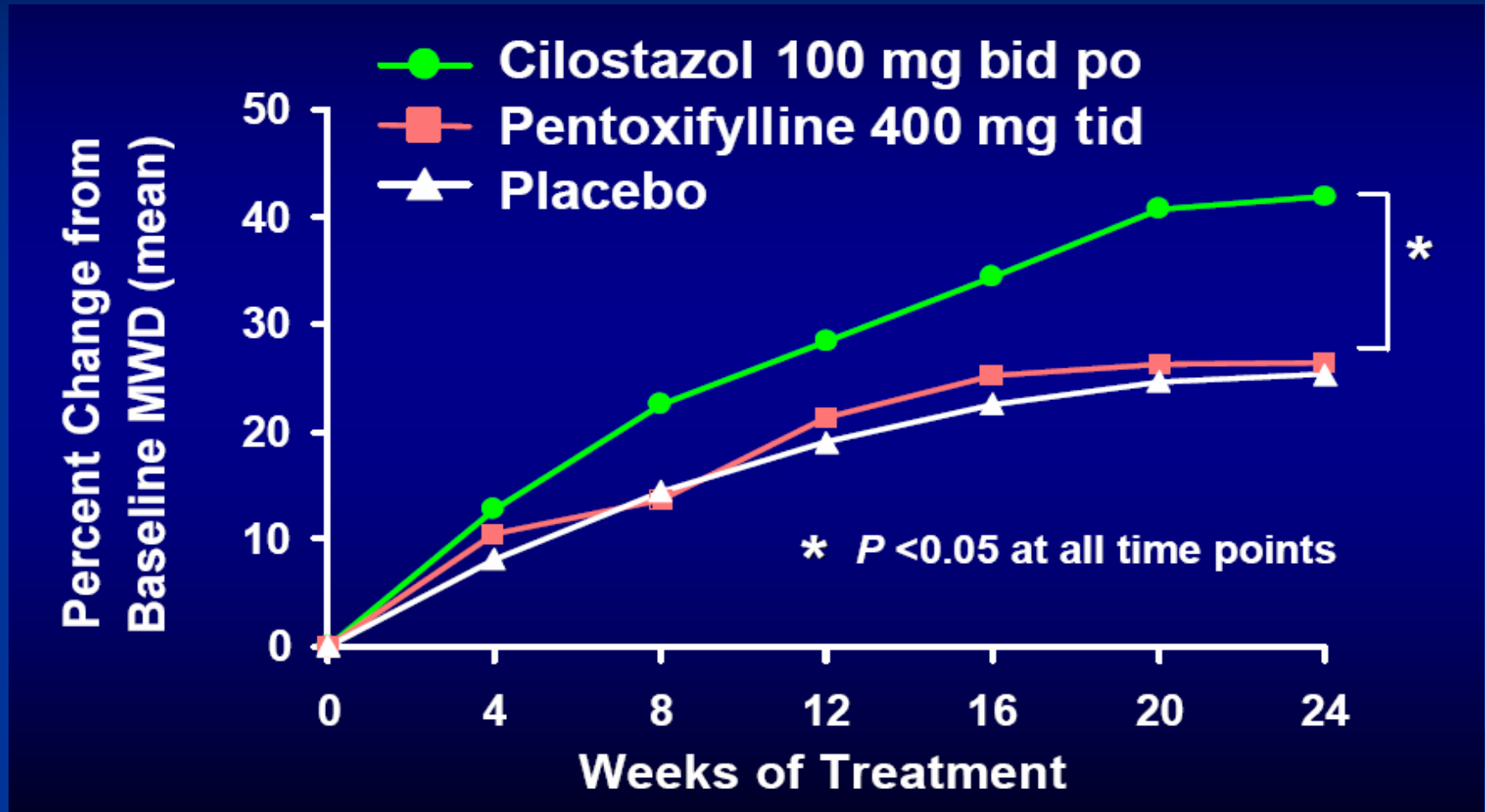
Dawson, et al. Am. J. Med., 2000

Management of PAD patients

- **Lifestyle modification**
  - Smoking cessation
  - Regular exercise training
  - Diet

- **Pharmacological treatment**
  - Antiplatelet therapy
  - Control risk factors (e.g. hypertension, blood glucose)
  - Vasodilators for symptomatic relief?

Management of PAD – intervention

- **Endovascular**
  - Revascularization (angioplasty)
  - Stent placement

- **Surgical**
  - Endarterectomy
  - Peripheral bypass graft
  - Amputation

Summary &Conclusions 1

- **PAD is a common disorder affect about 12% of populations in USA & increase to 20% in those over 70 y**

- **PAD is often underestimated and underdiagnosed, and requires proper diagnosis:**

- **Diagnosis of peripheral arterial disease is based mainly on the history, with examination and ankle brachial pressure index being used to confirm and localise the disease**

Summary&Conclusions2

- ABPI is a non-invasive, easily performed measurement that reliably predicts ischaemic risk in PAD patients with 95% sensitivity & 99% specificity

- Peripheral arterial disease is a marker for systemic atherosclerosis; the risk to the limb in claudication is low, but the risk to life is high

Summary & Conclusions 3

- **Patients with intermittent claudication should initially be treated with "best medical treatment"; some patients may be candidates for percutaneous angioplasty, but this treatment is not based on evidence**

- **Patients should be referred to a vascular surgeon if there is doubt about the diagnosis or evidence of aortoiliac disease or if the patient has not responded to best medical treatment or has severe disease**

A Call to Action

- **Increase awareness of PAD and its consequences**
- **Improve the identification of patients with symptomatic PAD**
- **Improve treatment rates among patients who have symptomatic PAD**
- **Initiate a screening protocol for patients at high risk for PAD**
- **Increase the rates of early detection among the asymptomatic population**

Belch et al., Arch. Int. Med., 2003; 163:884-892

Thank You