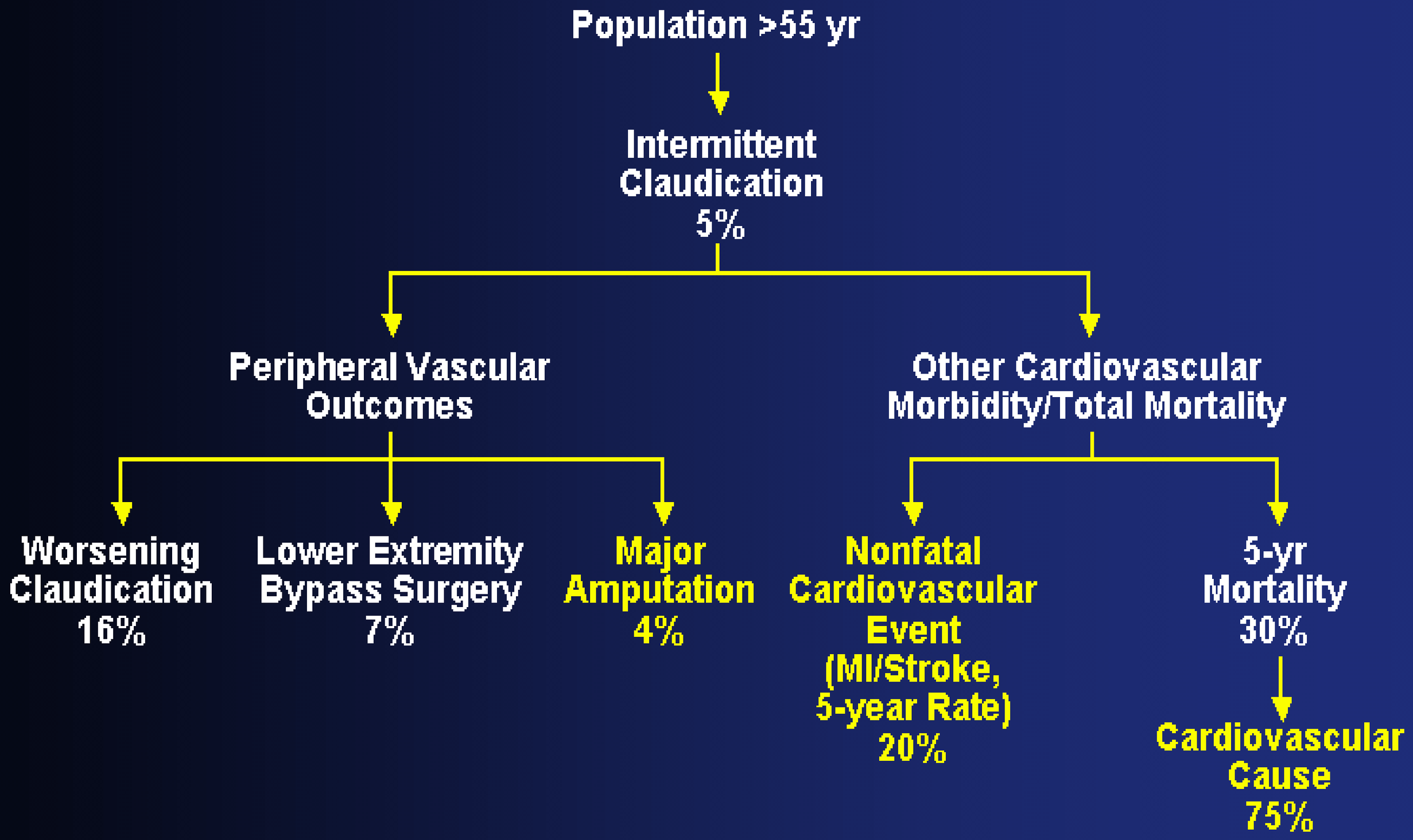
Peripheral arterial disease

- Asif Serajian DO FACC
- No disclosures relevant to this talk

Demographics

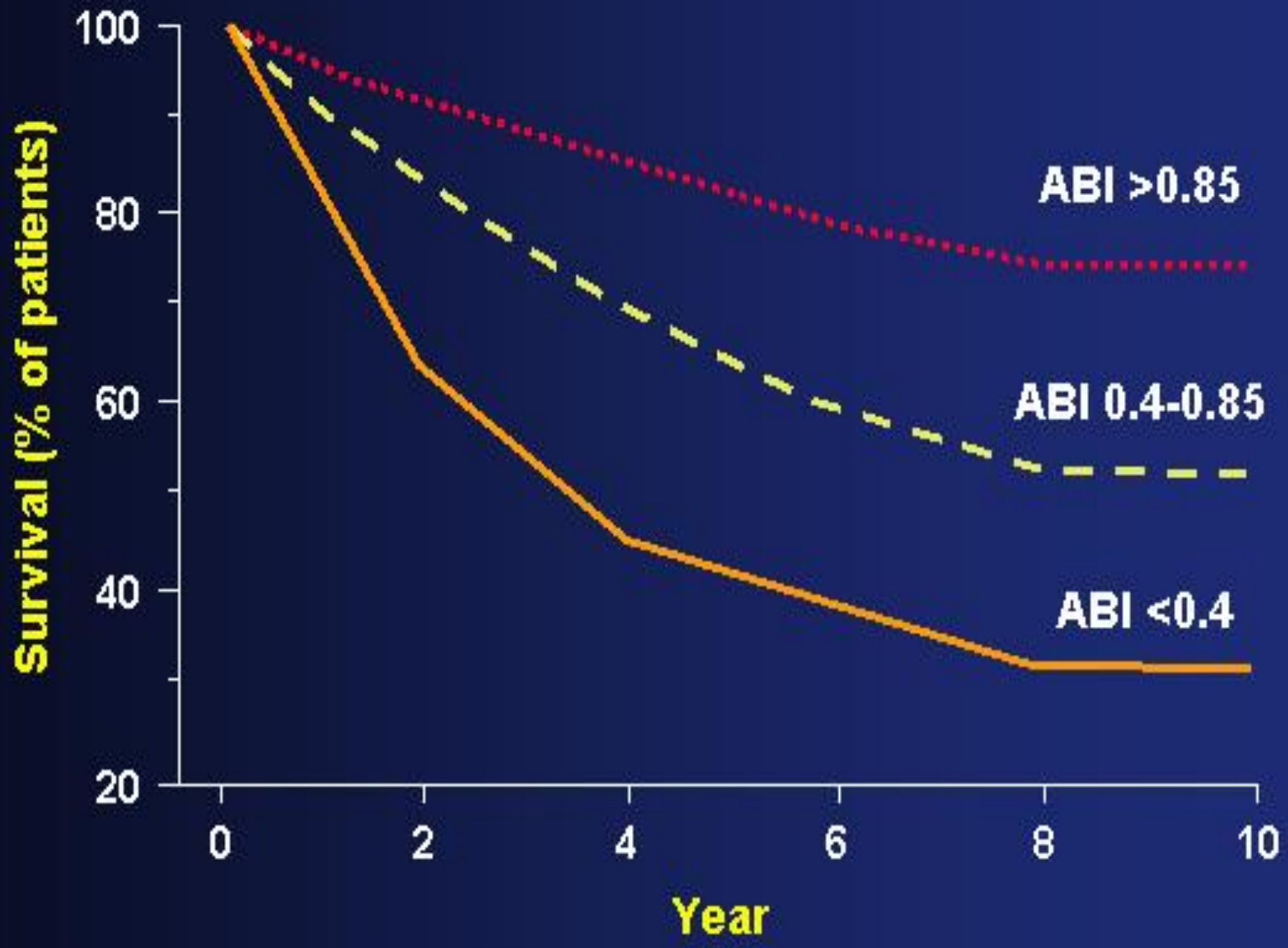
- Over age 50
- 1/3 diabetic
- 50% have CAD

Progression of Intermittent Claudication



Adapted from Weitz JI et al. *Circulation*. 1996;94:3026-3049.

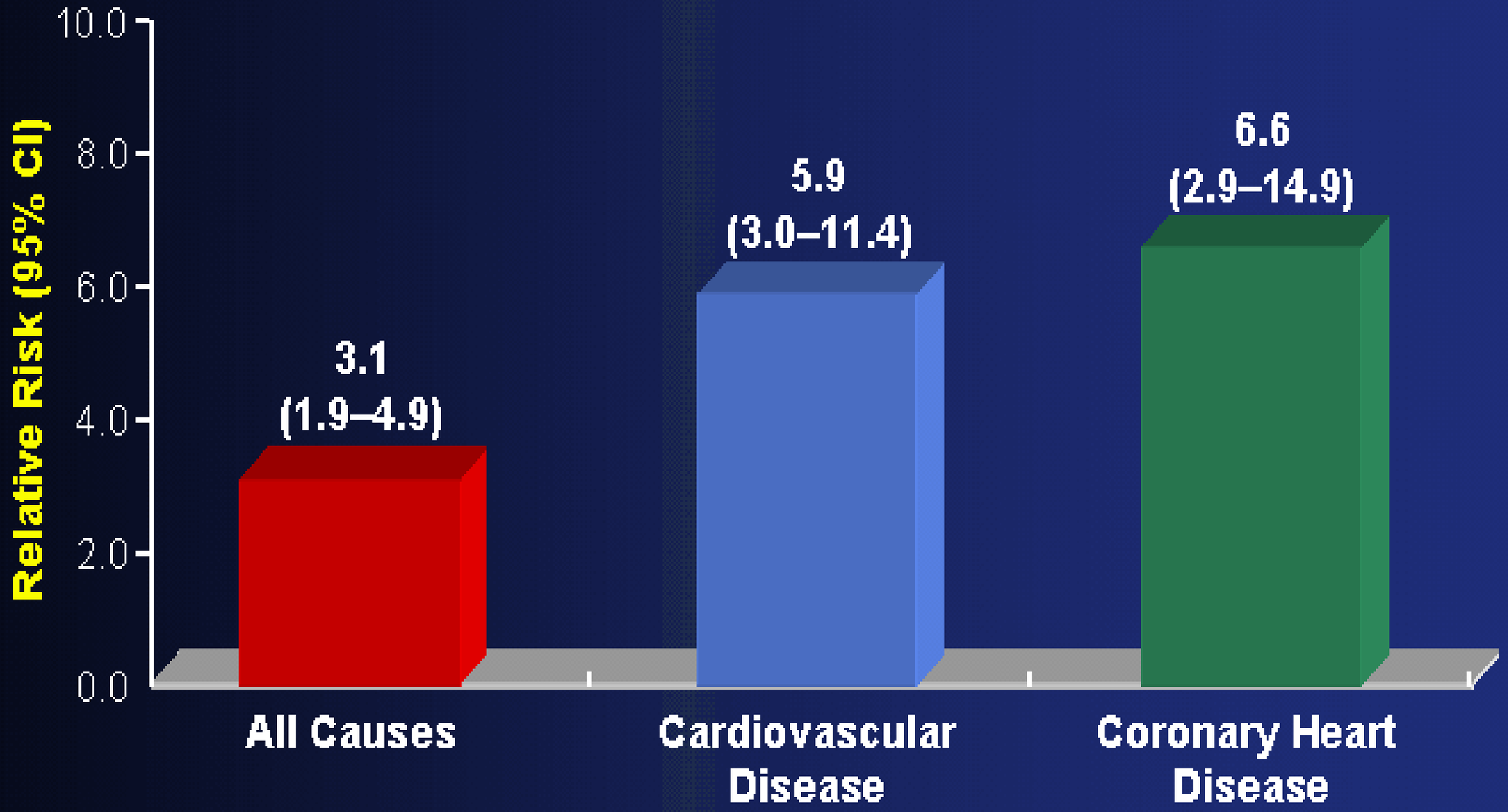
Decline in Survival Associated With Severity of PAD



ABI = ankle-brachial index, PAD = peripheral arterial disease.

McKenna M et al. *Atherosclerosis*. 1991;87:119-128.

Peripheral Arterial Disease and Relative Risk of Death



Adapted from Criqui MH et al. *N Engl J Med.* 1992;326:381.

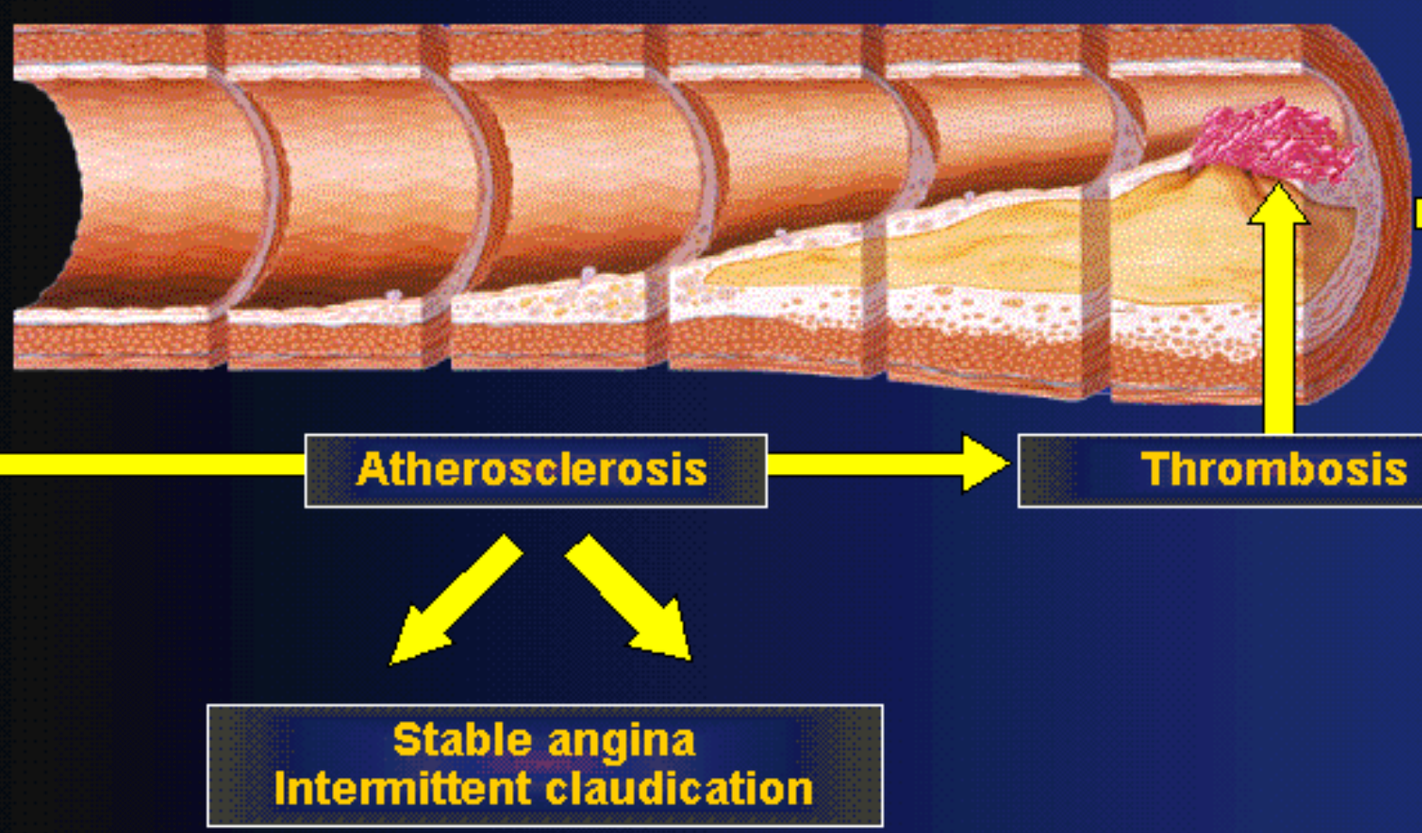
Long-term Risk of MI and Stroke

PAD

Post-MI

Post-Strok

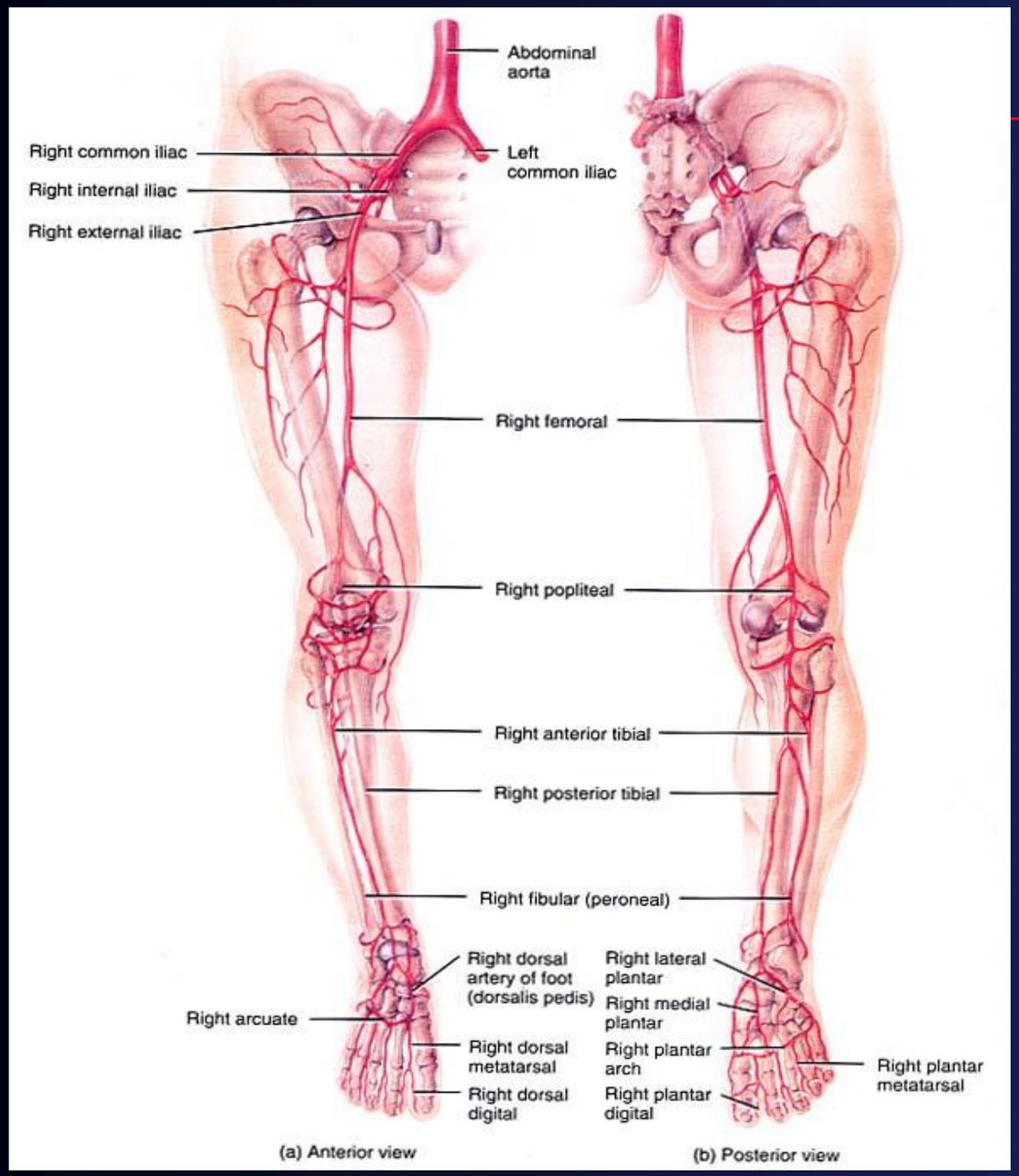
Vascular Disease: A Generalize and Progressive Process



Adapted from Stary HC et al. *Circulation*. 1995;92:1355-1374 and Fuster V. *Vasc Med*. 1998;3:231-239.

1. Adult Treatment Panel II. *Circu*
2. Kannel WB. *J Cardiovasc Risk*
3. Wilterdink JI, Easton JD. *Arch I*
4. Criqui MH et al. *N Engl J Med*. 1992;326:381-386.

Thrombosis and attributed to coronary heart disease.



PRIMARY SITES OF INVOLVEMENT

Femoral & Popliteal arteries: 80-90%

Tibial & Peroneal arteries: 40-50%

Aorta & Iliac arteries: 30%

DIAGNOSIS

- History taking
- Careful examination of leg
- Pulse evaluation
- Ankle-brachial index (ABI):

$$\frac{\text{SBP in ankle (dorsalis pedis and posterior tibial arteries)}}{\text{SBP in upper arm (brachial artery)}}$$

Am J Cardiol 2001; 87 (suppl): 3D-13D
NEJM 2001; 344: 1608-1621

Ankle-Brachial Index Values and Clinical Classification

Clinical Presentation	Ankle-Brachial Index
Normal	**> 0.90**
Claudication	**0.50-0.90**
Rest pain	**0.21-0.49**
Tissue loss	**< 0.20**

Values >1.25 falsely elevated; commonly seen in diabetics

Am J Cardiol 2001; 87 (suppl): 3D-13D
NEJM 2001; 344: 1608-1621

Other Noninvasive Diagnostic Tests

- Segmental blood pressure recording
- Segmental pulse volume recording
- Exercise stress testing
- Reactive hyperemia
- CW Doppler and duplex ultrasound

Rose SC. *J Vasc Interv Radiol.* 2000;11:1257-1275.

WHY IS IT NECESSARY TO TREAT INTERMITTENT CLAUDICATION ?

- Symptoms worsen in 25% of patients
- Approximately 5% will require amputation within 5 years
- Around 5-10% have critical limb ischemia; risk of limb loss
- Increased risk of mortality, primarily for cardiovascular causes

Am J Cardiol 2001; 87 (suppl): 3D-13D

MODIFICATION OF RISK FACTORS

- Smoking cessation
- Diabetes control (FBG 80-120 mg/dl, PPG ≤ 180 mg/dl, HbA_{1c} < 7%)
- Dyslipidemia management (LDL < 100 mg/dl, TG < 150 mg/dl): Statins (RR 38%; 4S)
- Hypertension control (BP < 130/85 mmHg)
- Ramipril [RR 28%; HOPE (n=4051)]

Am J Cardiol 2001; 87 (suppl): 3D-13D
NEJM 2001; 344: 1608-21
Am J Med 2002; 112: 49-57

ANTIPLATELET THERAPY

- **Aspirin**
- **Clopidogrel (CAPRIE Study)**

No studies have shown that aspirin or clopidogrel improves claudication symptoms

NEJM 2001; 344: 1608-21

FDA approved drugs for IC

- **Pentoxifylline – 1984**
- CILOSTAZOL - 1999

PENTOXIFYLLINE NOT RECOMMENDED FOR INTERMITTENT CLAUDICATION

- Inconsistent and modest benefit; non-significant increase in walking ability
- Not more effective than placebo in increasing walking ability or functional status
- Most trials small and not properly designed
- Study sample size and pentoxifylline response inversely correlated

"Data are insufficient to support its widespread use"

(Meta-analysis of pentoxifylline trials)

NEJM 2001; 344: 1608-1621
Am J Cardiol 2001; 87 (suppl): 19D-27D

Pharmacology of Cilostazol

- 9 genes identified for Phosphodiesterases, PDE I-IX
- cAMP is degraded by PDE-III present in
  - Vascular smooth muscle
  - Platelets
  - Cardiomyocytes
  - Endothelial cells
- cAMP mediates platelet inhibitory, vasodilatory and vascular antiproliferative responses in vivo

Ann Pharmac 2001;49:48-56

CILOSTAZOL EXERTS SIGNIFICANT ANTIPLATELET EFFECTS

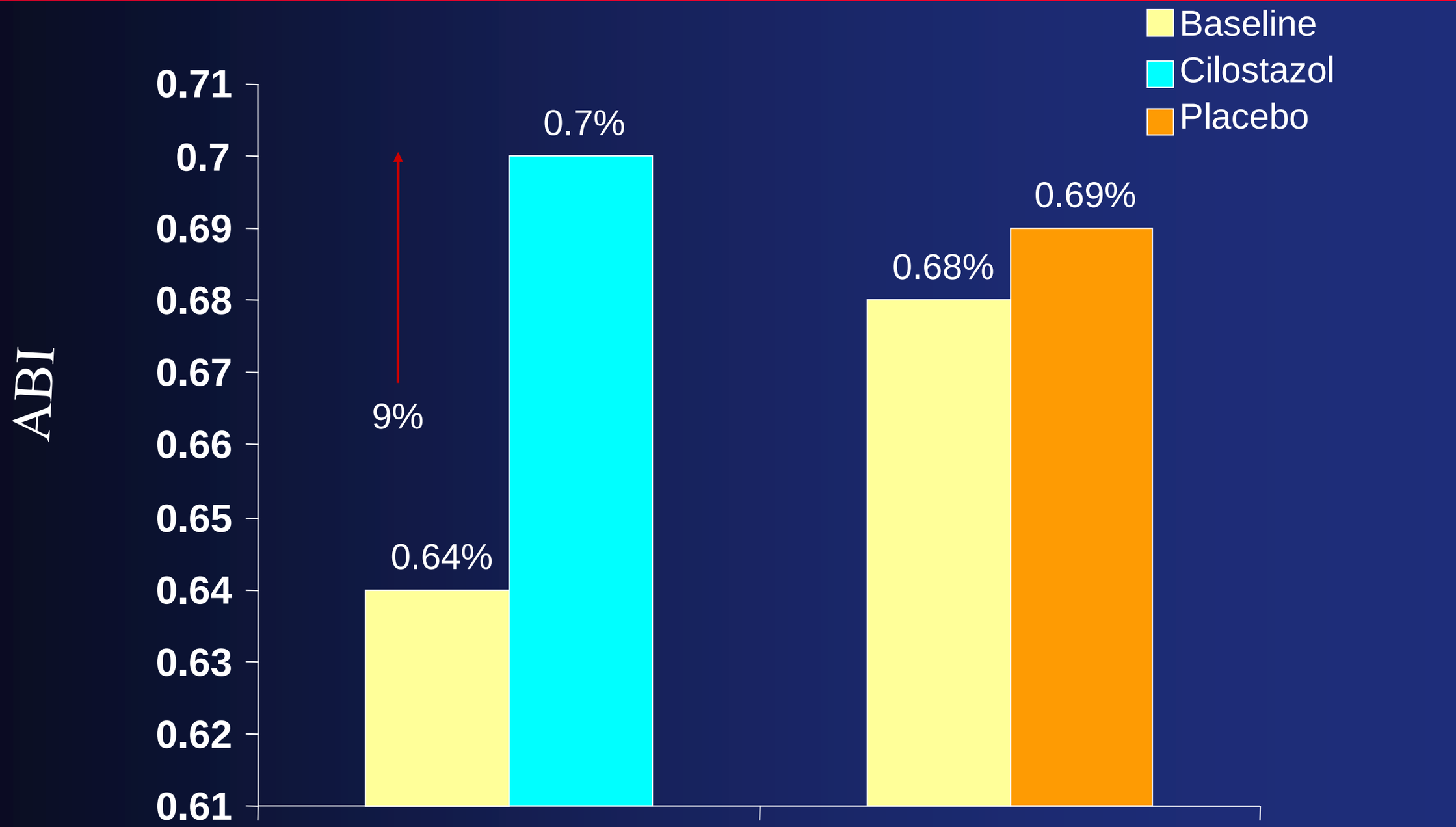
- **Inhibits platelet aggregation induced by ADP, collagen, adrenaline, arachidonic acid and thrombin**
- **More potent in suppressing platelet aggregation than aspirin or ticlopidine**

Ann Pharmacother 2001; 35: 48-56

Drugs & Aging 1999; 14: 63-71

Arzneim Forschung 1987; 37: 563-566

IMPROVES ANKLE-BRACHIAL INDEX



N=239; 16 wks
P value betn gps <0.0125

J Vasc Surg 1998; 27: 267-275

CILOSTAZOL AND HAND ISCHEMIA

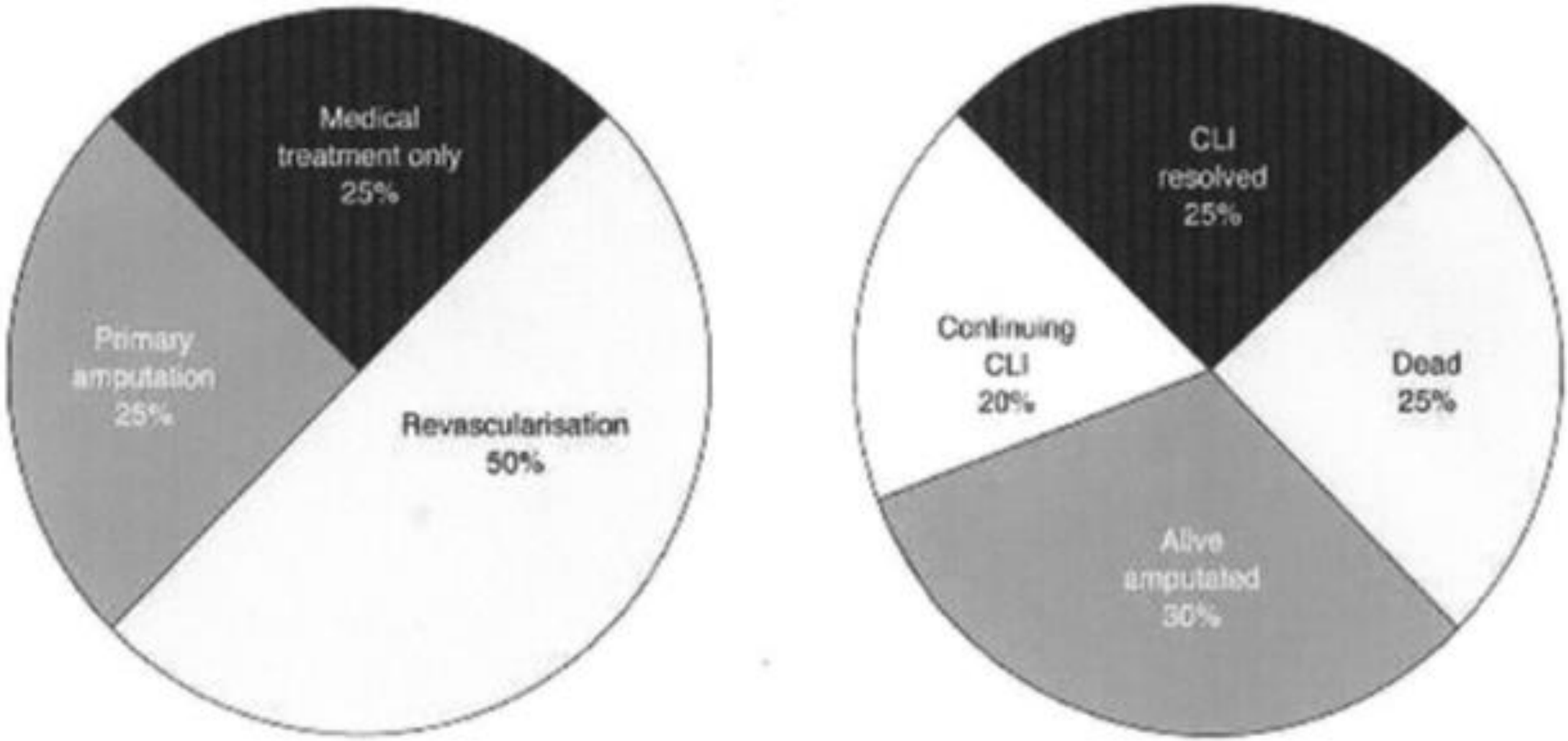
Three cases of digital ischemia successfully treated with cilostazol

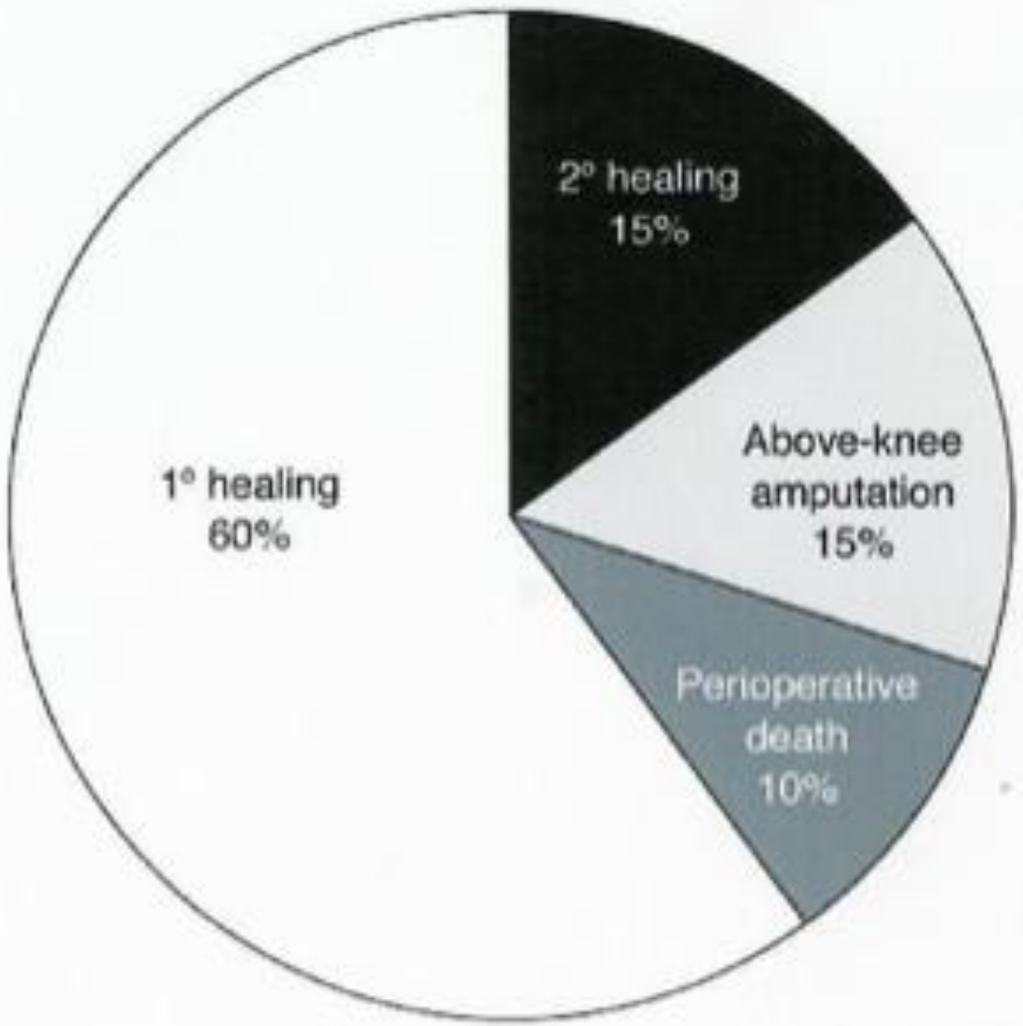
Patient 1: **Chronic, post-traumatic, cold, painful right fourth and fifth fingers. After 8 weeks of cilostazol therapy, fingers were warm and displayed normal perfusion**

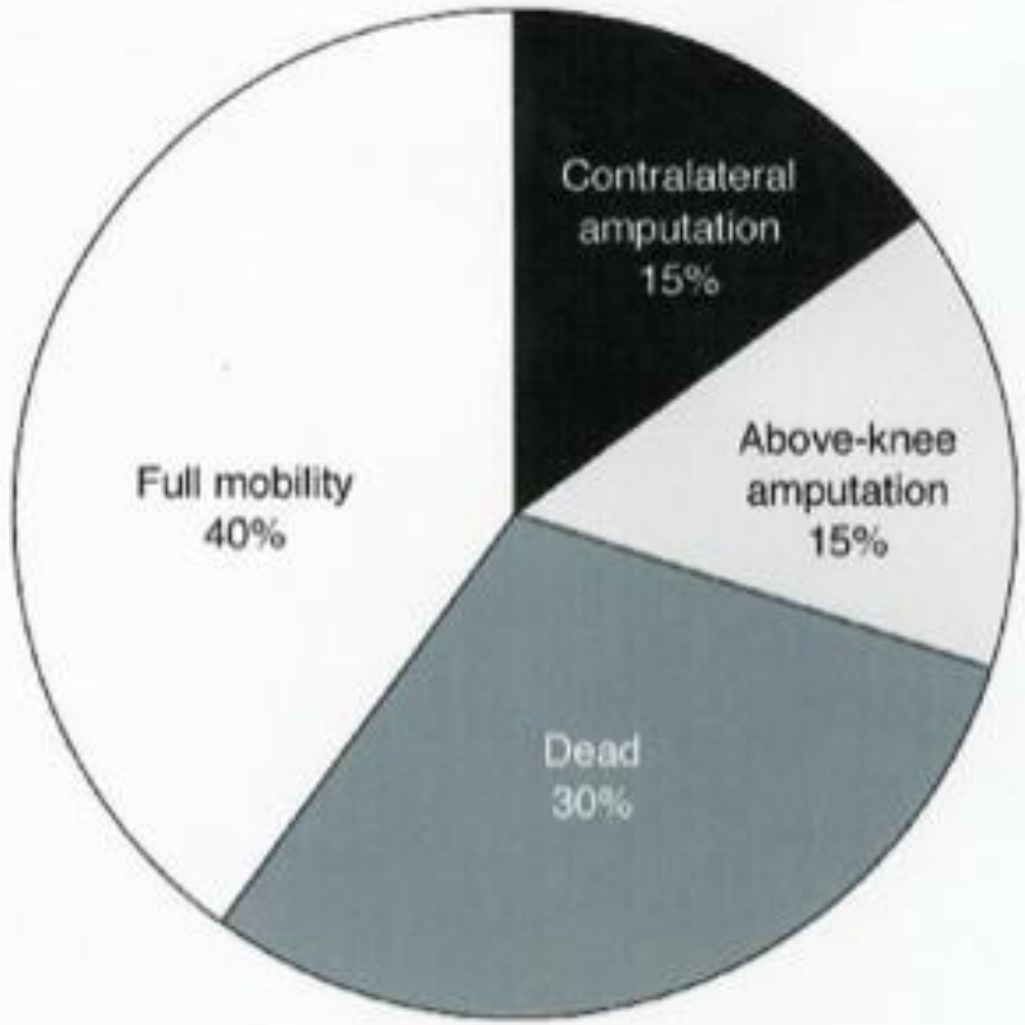
Patient 2: **Painful index finger ulceration. Within 4 weeks of cilostazol therapy, digital ulcers and pain resolved**

Patient 3: **Traumatic right fifth digital arterial thrombosis. Within 4 weeks of cilostazol therapy, pain and cyanosis had resolved**

Vasc Med 2001;6:245-248

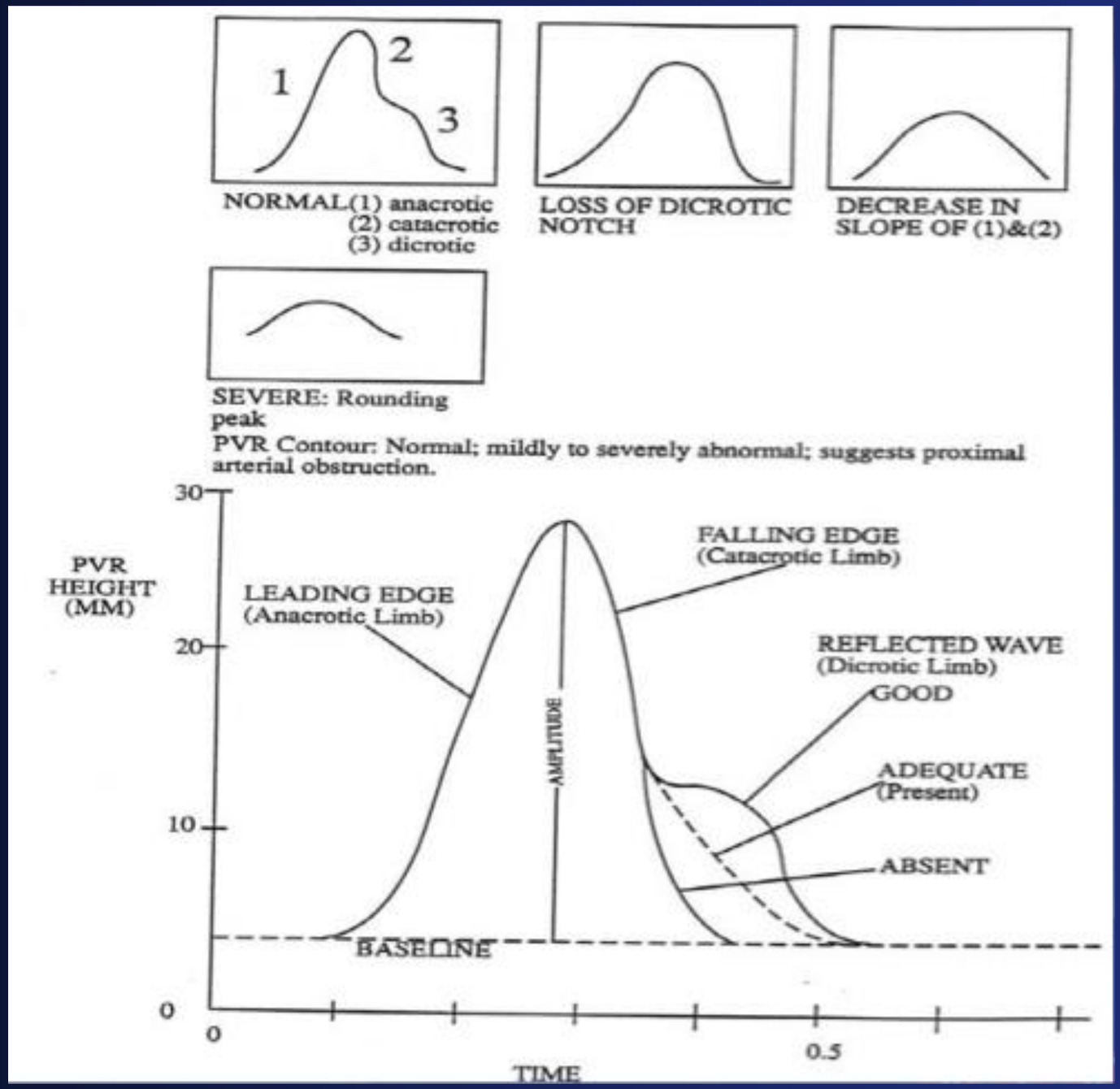

Primary treatment
A year later
Medical treatment only 25%
Primary amputation 25%
Revascularisation 50%
CLI resolved 25%
Continuing CLI 20%
Dead 25%
Alive amputated 30%


Early
2° healing
15%
Above-knee
amputation
15%
Perioperative
death
10%
1° healing
60%

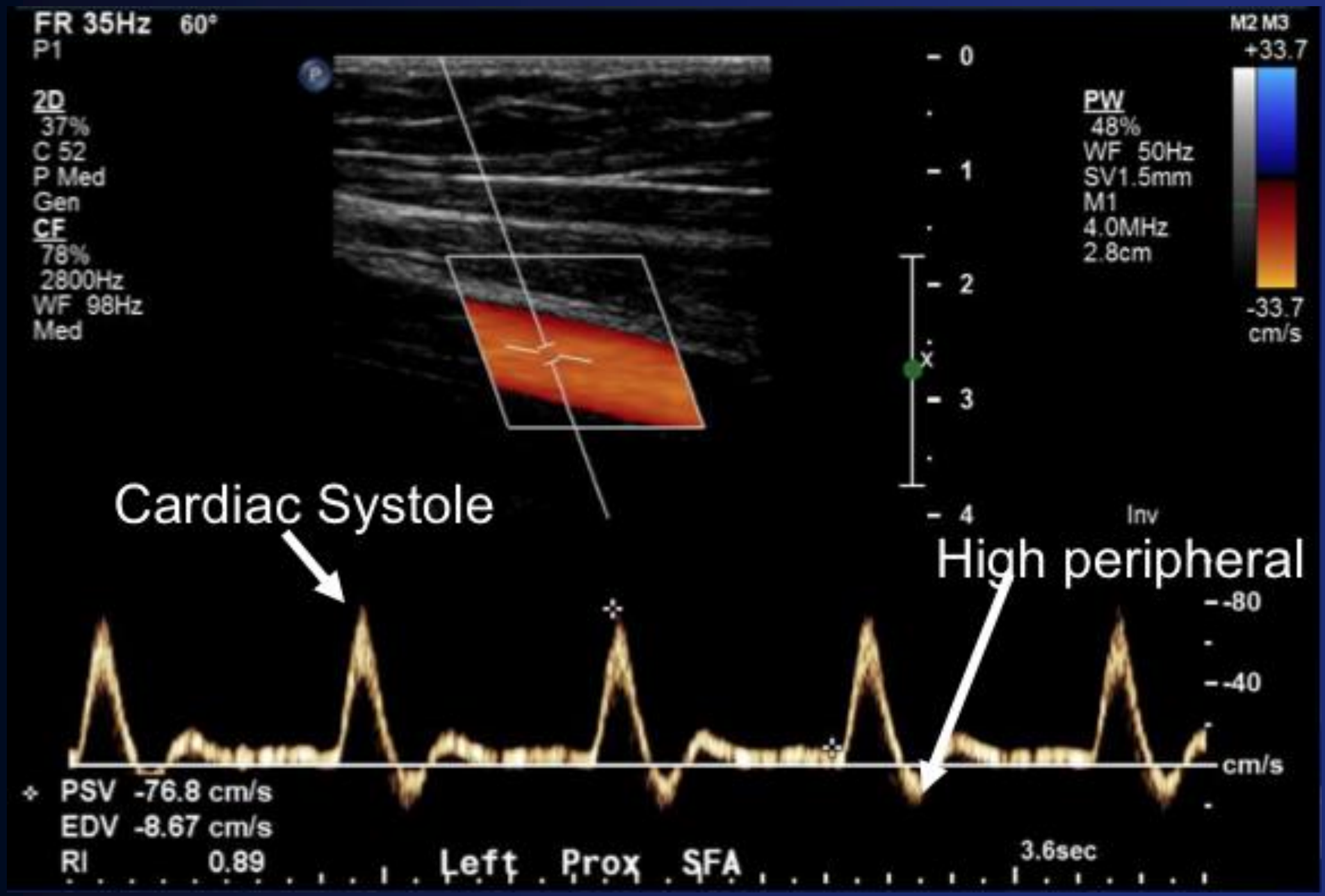

After 2 years
Contralateral
amputation
15%
Above-knee
amputation
15%
Dead
30%
Full mobility
40%

Tibeoperoneal vessels usually involved

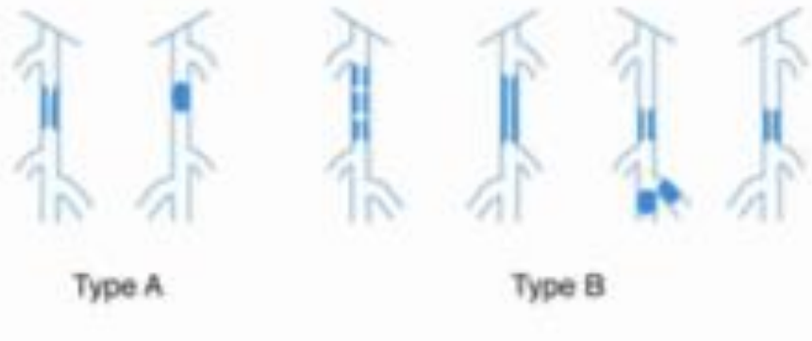
Pulse volume recording



Arterial duplex



TASC Classification/Recommendations SFA/Popliteal



→ Endovascular Tx

→ Surgical Tx

Lesion type	Description
A	Single stenosis ≤10 cm in length *Single occlusion ≤5 cm in length*
B	Multiple lesions (stenoses or occlusions), each ≤5 cm *Single stenosis or occlusion ≤15 cm not involving the infrageniculate popliteal artery* Single or multiple lesions in the absence of continuous tibial vessels to improve inflow for a distal bypass *Heavily calcified occlusion ≤5 cm in length* Single popliteal stenosis
C	Multiple stenoses or occlusions totaling >15 cm with or without heavy calcification *Recurrent stenoses or occlusions that need treatment after two endovascular interventions*
D	Chronic total occlusions of CFA or SFA (>20 cm, involving the popliteal artery) *Chronic total occlusion of popliteal artery and proximal trifurcation vessels*

Vascular Surgical Procedures for Outflow Improvement

Outflow Procedure	Oprerative Mortality (%)	Expectied Patency Rate (%)
Fem-AK popliteal vein	1.3 to 6.3	66 (5 years)
Fem-AK popliteal prosthetic	1.3 to 6.3	50 (5 years)
Fem-BK popliteal vein	1.3 to 6.3	66 (5 years)
Fem-BK popliteal prosthetic	1.3 to 6.3	33 (5 years)

Bell, D. Podiatry Management April/May 2009

Assessment of touch pressure

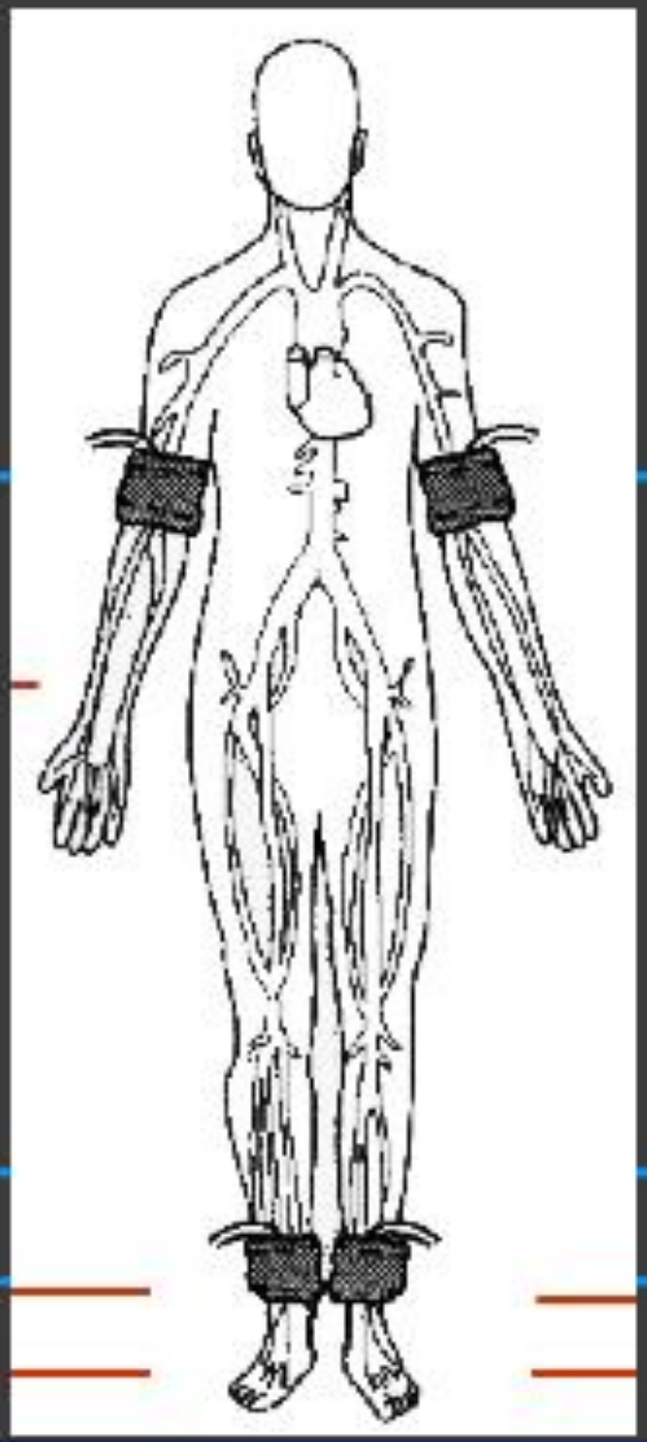
- 10 gram monofilament
- Assesses loss of protective sensation
- Failure defined by inability to sense 4/10 locations per plantar aspect
- Insensate patients have 7x risk of ulcer!!

	Fontaine			Rutherford
Stage	Clinical	Grade	Category	Clinical
I	Asymptomatic	0	0	Asymptomatic
IIa	Mild Claudication	0	1	Mild Claudication
IIb	Moderate/Severe	I	2	Moderate
III	Rest Pain	II,III	3	Severe
IV	Ulcer/Gangrene	III	4	Rest Pain/Minor Tissue Loss
			5	Minor Tissue Loss
			6	Major Tissue Loss

ABI Measurement

Right arm pressure

Left arm pressure



Pressure:
PT
DP

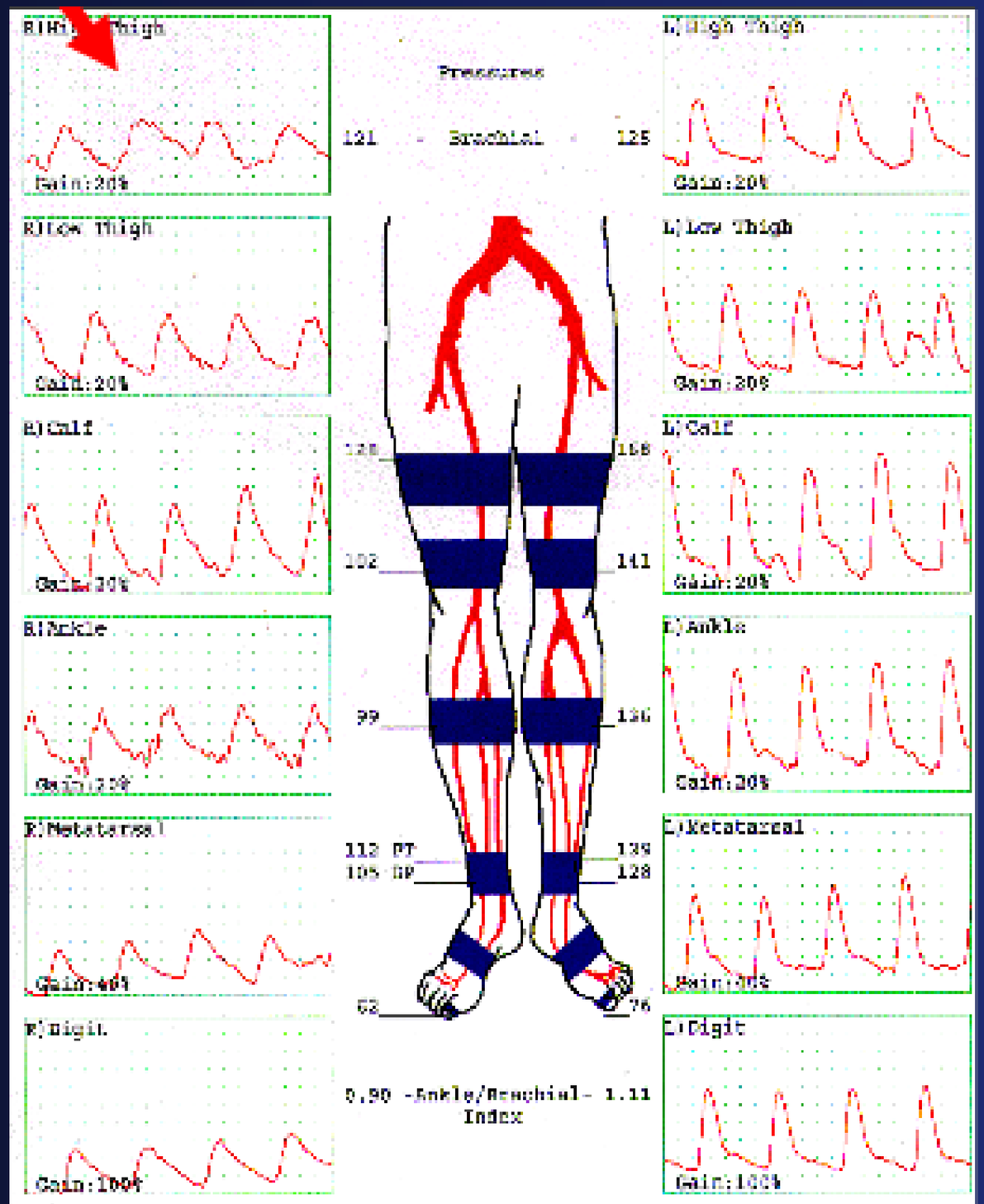
Pressure:
PT
DP

ABI Result	Clinical Interpretation	Comments
>1.3	Non-compressible	Results not useful
1.0-1.3	Partially Non-compressible	Need to Correlate with history
0.97-1.0	Normal	
0.8-0.96	Mild Ischemia	Walk 2 blocks pain free
0.4-0.79	Moderate to Severe	Pain at < 2 blocks
<0.39	Severe Ischemia	Potential limb loss

Segmental pressure test

Location of Pressure	Normal Values
Ankle Pressure	> Brachial Pressure
Ankle Pressure Index	1.0-1.2, Abnormal is <0.95
Ankle Pressure p Exercise	<20% decrease of Baseline
Proximal thigh pressure	30-40mmHg > brachial
Segmental Pressures	< 20mmHg difference in levels
Toe Pressure	>60% of brachial pressure
Toe Index	Normal >0.60, Ischemic rest pain <0.15

Iliac stenosis



Abdominal aortic aneurysm

- 98% infra-renal
- Defined as AP diameter >= 3
- Risk factors are smoking, hypertension and family history
- Exam may have bruit, they may present with back pain
- Monitoring < 4 cm US q 2 -3 years, 4- 5.4 monitor q 6 to 12 months
- Surgery for > 5.5 or size > 0.5 cm/ 6 mo

Thoracic aortic aneurysm

- Marfan's syndrome
- Bicuspid aortic valve
- Turner's syndrome
- Loey's-Dietz Syndrome

Acute arterial occlusion

- Cardiac origin 80-90%
- Atrial fibrillation = 75%
- left ventricular thrombus
- Endocarditis
- La mixoma
- Paradoxical
- Plaque ulceration

Arterial occlusion

- Pain
- Pallor
- Polar
- Pulseless
- Parenthesis
- Paralysis

DDx

- Phlegmasia cerulean dolens
- Aortic dissection
- Low cardiac output state

Buerger's disease: Thromboangiitis Obliterans

- Inflammatory occlusive disease of small and medium sized peripheral arteries and veins
- Young male (90% males)
- Age of onset =< 50 years and at times < 30 years
- Risk factor is smoking

- Numbness/parathesias
- Writer's cramp
- Ulceration
- Claudication
- Thrombophlebitis (migrating)
- May involve distal digits