

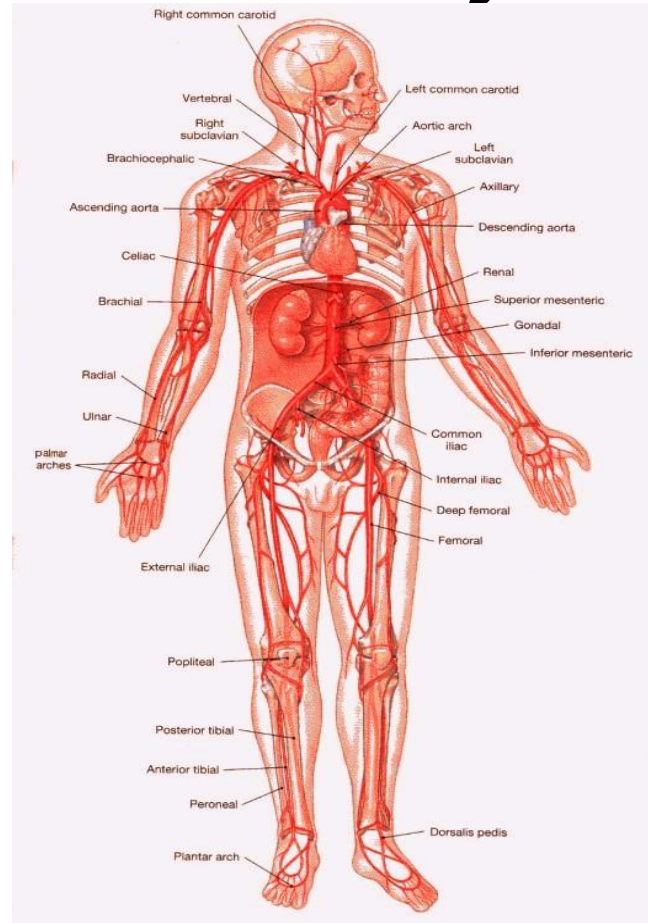
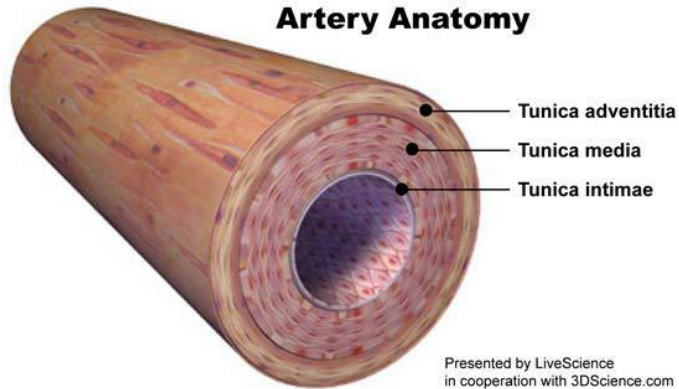


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# Peripheral Arterial Disease: An Overview

**Badr Aljabri, MD, FRCSC**

# Arterial Anatomy



# What is Atherosclerosis?

- Clogging, narrowing, and hardening of large and medium-sized arteries

# Risk factors for Atherosclerosis

## Non-Modifiable Risk Factors:

- Male gender
- Advanced age
- Family history

## Modifiable Risk Factors:

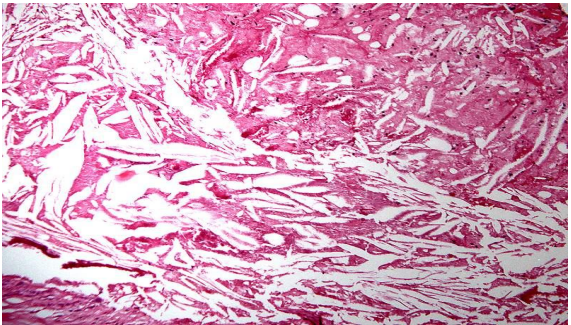
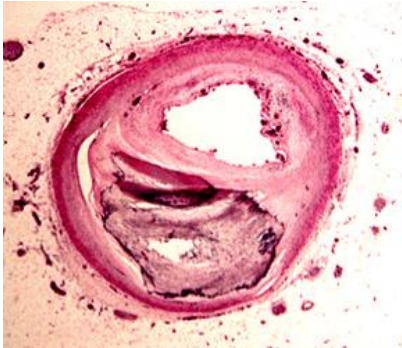
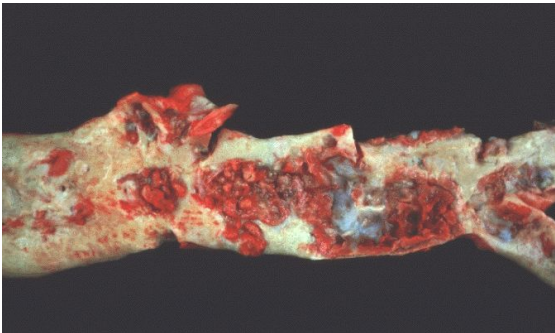
### Major

- Diabetes
- Smoking
- Hypertension
- Hyperlipidemia

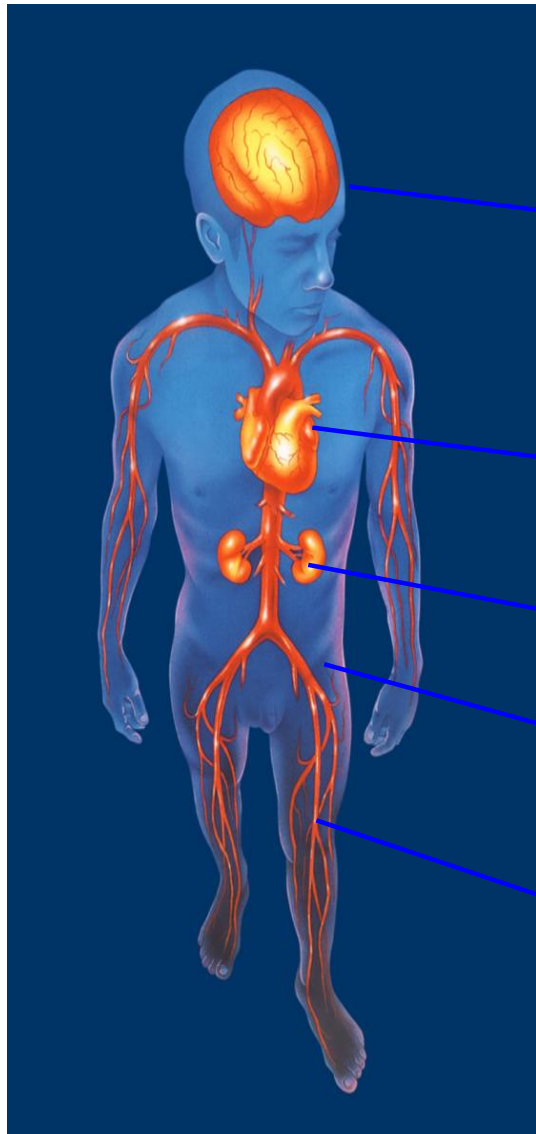
### Minor

- Homocystenemia
- Obesity
- Hypercoaguable state
- Physical inactivity

# Pathogenesis



# Clinical Spectrum of Atherosclerosis



– Cerebrovascular disease

– Coronary artery disease

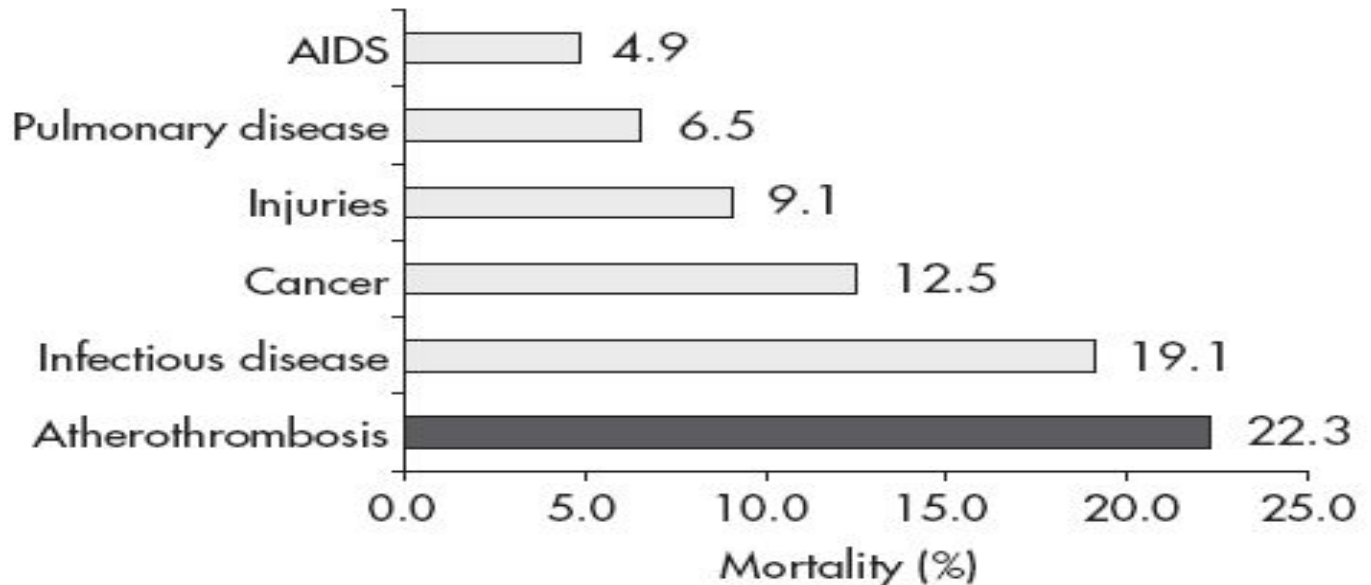
– Renal artery Diseases

– Visceral arterial disease

– Peripheral arterial disease

- Intermittent claudication
- Critical limb ischemia

# What is the burden of Atherosclerosis?



**Fig. 1.** Atherothrombosis is the leading cause of death worldwide. Data from the World Health Organization Report, Geneva.<sup>[3]</sup>

## What is Peripheral Arterial Disease?

PAD is an **atherosclerotic disease** of the lower extremities arterial tree and may involve the aorto-iliac and/or femoropopliteal and tibial arteries



# Why it is important to recognize patients with PAD?



PAD is a marker of **systemic** atherosclerosis

Patients with either symptomatic or asymptomatic PAD generally have **widespread** arterial disease

# Why it is important to recognize patients with PAD?

	Increased risk of MI*	Increased risk of stroke*
PAD	<b>4 X</b> greater risk <sup>4</sup> (includes only fatal MI and other CHD death)	<b>2-3 X</b> greater risk <sup>3</sup> (includes TIA)

**PAD places individuals at high short and long term risk of MI, Stroke & Death**

2. Kannel WB. *J Cardiovasc Risk*. 1994; 1:333-339.

3. Wilterdink JJ, Easton JD. *Arch Neurol*. 1992;49:857-863.

4. Criqui MH et al. *N Engl J Med*. 1992;326:381-386.

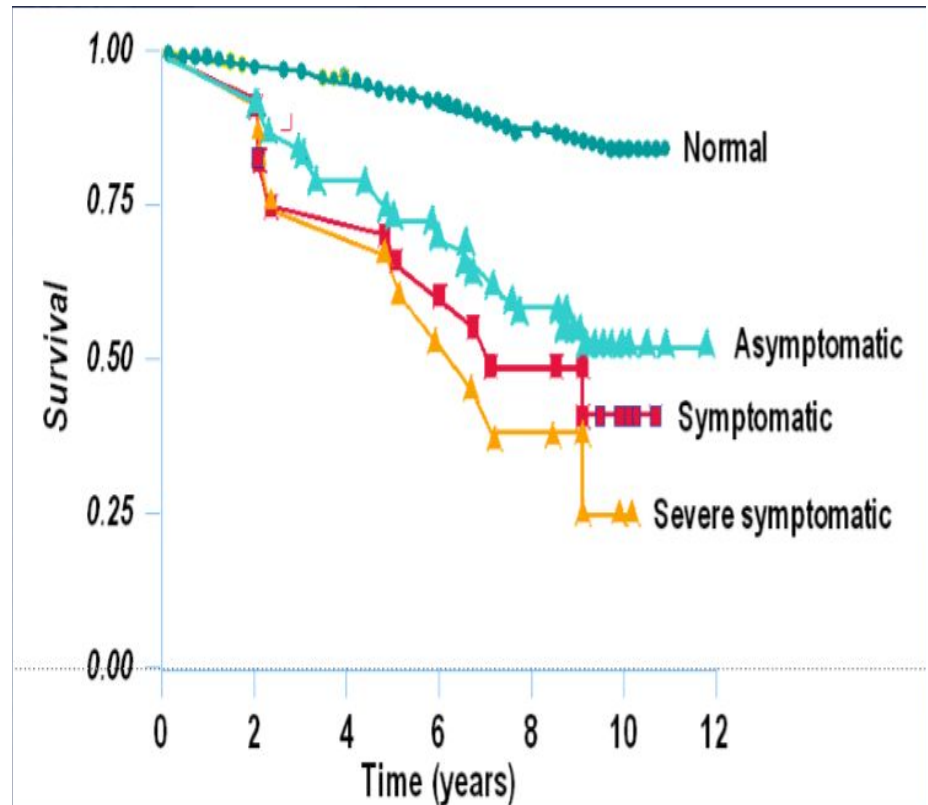
\*versus the general population

†Sudden death defined as death documented within 1 hour and attributed to coronary heart disease.

# Why it is important to recognize patients with PAD?

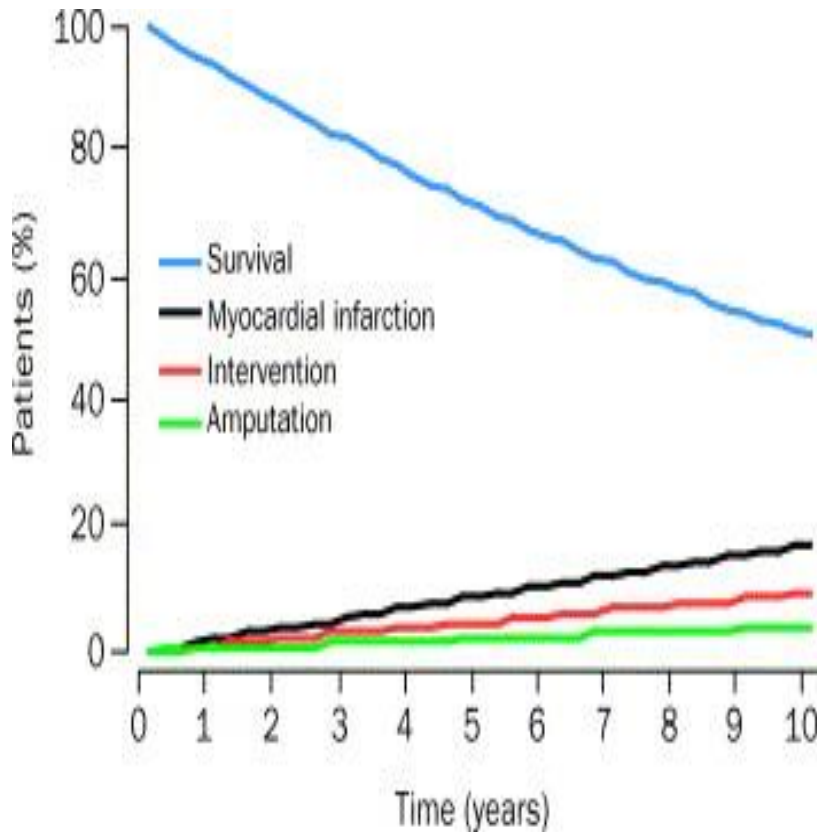
Life expectancy  
reduced by  
**10 years** in patients  
with PAD

**Mortality rate**  
~ 25% at 5 years  
~ 50% at 10 years  
~ 75% at 15 years



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

# Natural History

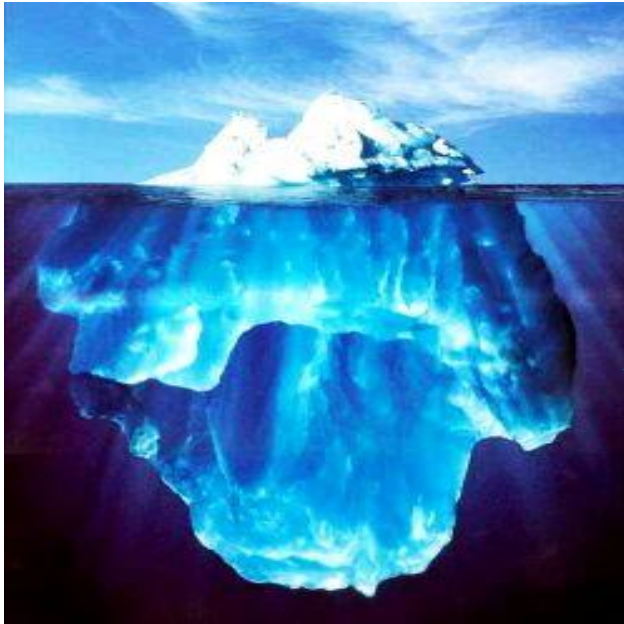


- Annual risk :
  - Mortality 6.8%
  - MI 2.0%
  - Intervention 1.0%
  - Amputation 0.4%

# Clinical Spectrum of PAD

PERIPHERAL ARTERIAL DISEASE CONTINUUM Presentation to health care system			
Asymptomatic	Intermittent Claudication	Critical Limb Ischemia	
<b>Asymptomatic</b> <i>Found during a physical exam (ABI)</i>	<b>Symptomatic</b> <i>Complaint of pain upon exertion</i>	<b>Rest Pain</b>	<b>Tissue Loss</b>

# How do patients with PAD present?



**Symptomatic**  
10%

**Asymptomatic**  
90%

# How do we diagnose patients with PAD?

## History

- Symptoms (claudication, rest pain and tissue loss)
- Risk factors
- Associated atherosclerotic diseases

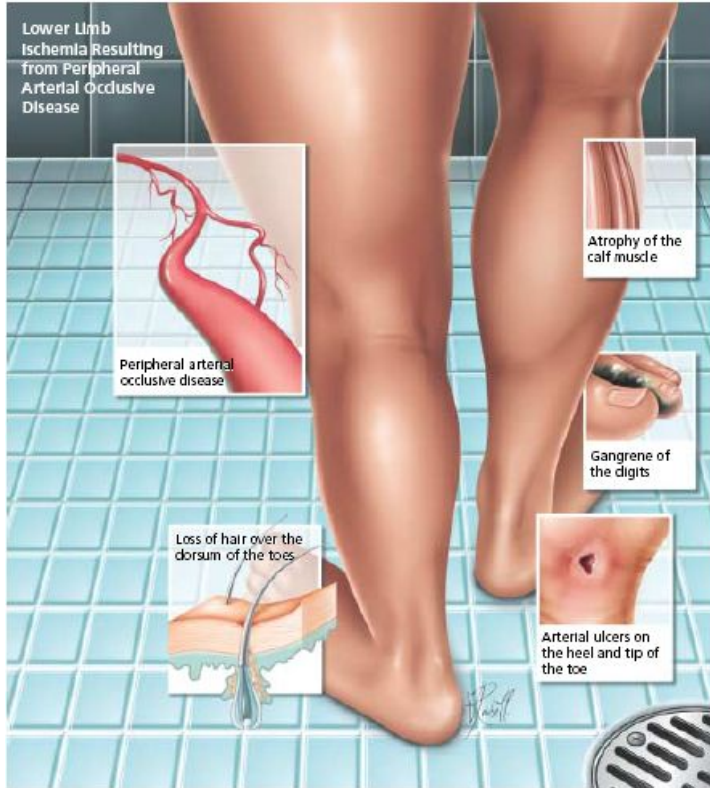
How do we diagnose patients with PAD?

## Physical Examination

- Signs (ischemic changes and tissue loss)
- Signs of associated atherosclerotic diseases



# How do patients with PAD present?



# How do we diagnose patients with PAD?

## Investigations

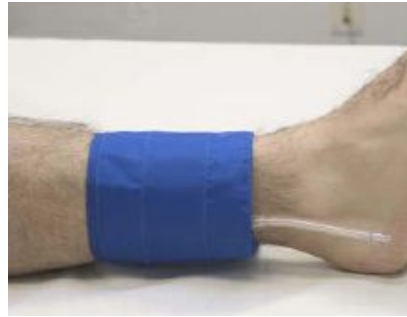
### Why?

- Establish the diagnosis
- Determine the extent of the disease (severity)
- Assess the presence of other atherosclerotic disease (risk stratification)

### How?

- Non-invasive tests (ABI measurement, arterial duplex, CTA, MRA)
- Invasive test (Conventional angiogram)

# Ankle Brachial Index



**ABI= Ankle SBP(PT or DP)/ Highest Arm SBP**

# Ankle Brachial Index

**ABI= Ankle SBP(PT or DP)/ Highest Arm SBP**

**ABI value**

**Indicates**

<0.9

Abnormal

0.8- 0.9

Mild PAD

0.5- 0.8

Moderate PAD

<0.5

Severe PAD

<0.25

Very Severe PAD

The ABI has limited use in evaluating calcified vessels that are not compressible (25% of diabetics)



# Toe pressure



Toe pressure < 70mmHg

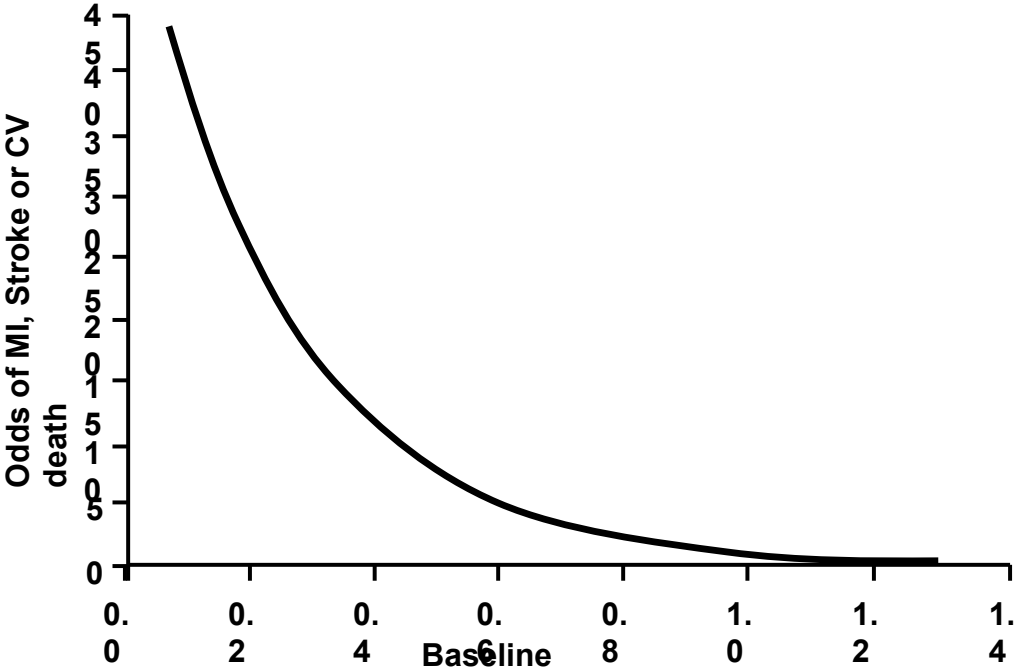
TBI < 0.70

# Role of ABI in PAD

- Confirms the diagnosis of PAD
- Detects significant PAD in (sedentary) asymptomatic patients
- Used in the differential diagnosis of leg symptoms to identify a vascular etiology
- Identifies patients with reduced limb function (inability to walk defined distances or at usual walking speed)
- Provides key information on long-term prognosis
  - A 3–6-fold increased risk of CV mortality with an ABI <0.90
- Provides further risk stratification
  - A lower ABI indicating worse prognosis
  - A Framingham risk score between 10%–20%
- Highly associated with coronary and cerebral artery disease

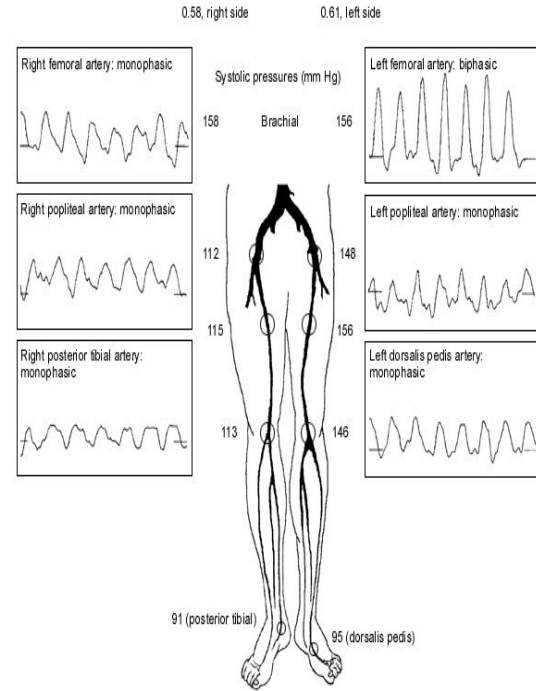
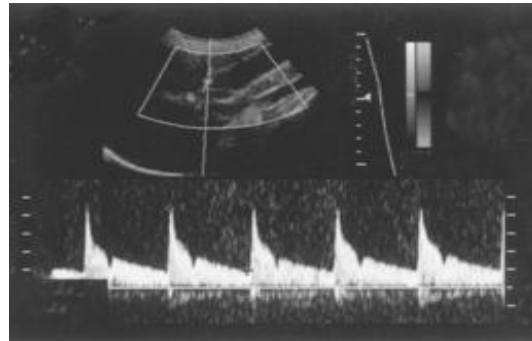
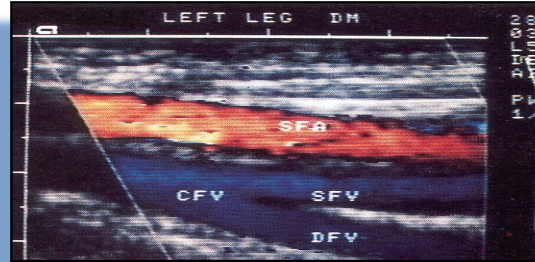
# Relationship Between ABI and Fatal and Non-fatal CV events

The lower the ABI the higher the 5-year risk of a cardiovascular event



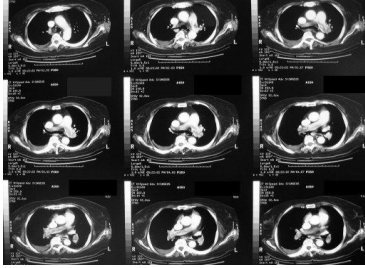
Mehler PS et al. *Circulation*. 2003;107:753-756  
Norgren L et al. *Eur J Vasc Endovasc Surg*. 2007;33(suppl 1):S1-S75

# Investigations

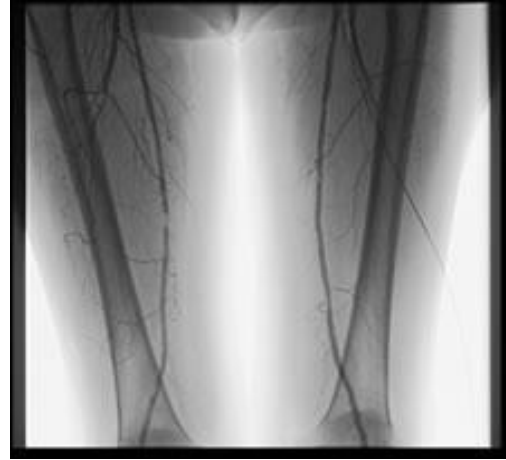




# Investigations



# Investigations



Treatment

# Goals for treating patients with PAD

Relief symptoms

Improve quality of life

Limb salvage

Prolong survival

# Strategies in treating patients with PAD

**Risk Factors Modification**

**Improve Lower Limb Circulation**

# Strategies in treating patients with PAD

## Risk Factors Modification

- Diet and weight control
- Exercise
- Antiplatelets
- Hypertension control
- Diabetes control
- Lipid control
- Smoking Cessation

# Summary of the Evidence

<i>Goals</i>	<b>Recommendation</b>	<b>Class of recommendation</b>	<b>Level of evidence</b>
Blood pressure	Systolic <140 mm Hg in all patients <130 mm Hg in diabetic patients	I	A
	Diastolic <90 mm Hg in all patients <80 mm Hg in diabetic patients		
	LDL-C < 2.5 mmol/l in all patients	I	A
	Diabetes A1c < 7% in diabetic patients	I	B
	Smoking Complete cessation in all patients	I	B
	BMI < 30 kg/m <sup>2</sup> in all patients 18.5-24.9	I	B
	Physical Activity 150 minutes (5 days/week 30	I	B

# Summary of the Evidence

<i>Medications</i>	<b>Recommendation</b>	<b>Class of recommendation</b>	<b>Level of evidence</b>
<b>Antiplatelets</b>	All patients	I	A
<b>Statins</b>		All patients <sup>I</sup>	A
<b>ACE inhibitors</b>	Symptomatic patients Asymptomatic patients	I IIa	B B



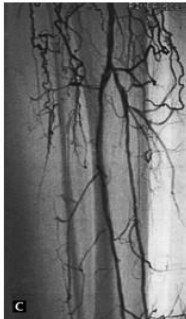
# Strategies in treating patients with PAD

## *Revascularization*

Exercise

Angioplasty +/- Stenting

Surgical Bypass



# TASC II- Practice Guidelines



**Choosing** between technique with equivalent short- and long- term clinical outcomes

## Recommendation 35

In a situation where endovascular revascularization and open repair/bypass of a specific lesion causing symptoms of peripheral arterial disease give equivalent short-term and long-term symptomatic improvement,

**endovascular techniques** should be used first. **[B]**

# Aorto-iliac Lesions

## Classification

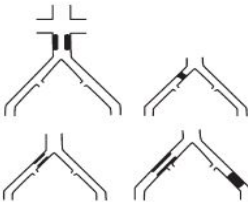
### Type A lesions

- Unilateral or bilateral stenoses of CIA
- Unilateral or bilateral single short ( $\leq 3$  cm) stenosis of EIA



### Type B lesions:

- Short ( $\leq 3$ cm) stenosis of infrarenal aorta
- Unilateral CIA occlusion
- Single or multiple stenosis totaling 3–10 cm involving the EIA not extending into the CFA
- Unilateral EIA occlusion not involving the origins of internal iliac or CFA



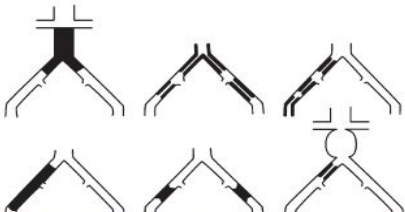
### Type C lesions

- Bilateral CIA occlusions
- Bilateral EIA stenoses 3–10 cm long not extending into the CFA
- Unilateral EIA stenosis extending into the CFA
- Unilateral EIA occlusion that involves the origins of internal iliac and/or CFA
- Heavily calcified unilateral EIA occlusion with or without involvement of origins of internal iliac and/or CFA



### Type D lesions

- Infra-renal aortoiliac occlusion
- Diffuse disease involving the aorta and both iliac arteries requiring treatment
- Diffuse multiple stenoses involving the unilateral CIA, EIA, and CFA
- Unilateral occlusions of both CIA and EIA
- Bilateral occlusions of EIA
- Iliac stenoses in patients with AAA requiring treatment and not amenable to endograft placement or other lesions requiring open aortic or iliac surgery



## Recommendations

### Recommendation 36

#### Treatment of aortoiliac lesions

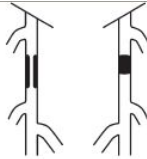
- TASC A and D lesions: Endovascular therapy is the treatment of choice for type A lesions and surgery is the treatment of choice for type D lesions [C].
- TASC B and C lesions: Endovascular treatment is the preferred treatment for type B lesions and surgery is the preferred treatment for good-risk patients with type C lesions. The patient's co-morbidities, fully informed patient preference and the local operator's long-term success rates must be considered when making treatment recommendations for type B and type C lesions [C].

# Femoral Popliteal Lesions

## Classification

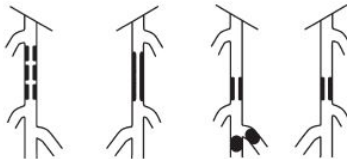
### Type A lesions

- Single stenosis  $\leq 10$  cm in length
- Single occlusion  $\leq 5$  cm in length



### Type B lesions:

- Multiple lesions (stenoses or occlusions), each  $\leq 5$  cm
- Single stenosis or occlusion  $\leq 15$  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  $\leq 5$  cm in length
- Single popliteal stenosis



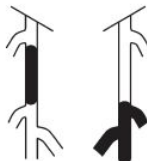
### Type C lesions

- Multiple stenoses or occlusions totaling  $> 15$  cm with or without heavy calcification
- Recurrent stenoses or occlusions that need treatment after two endovascular interventions



### Type D lesions

- Chronic total occlusions of CFA or SFA ( $> 20$  cm, involving the popliteal artery)
- Chronic total occlusion of popliteal artery and proximal trifurcation vessels



## Recommendations

### Recommendation 37

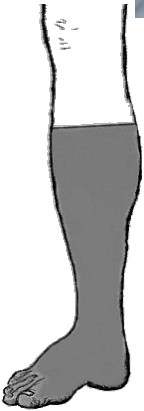
#### Treatment of femoral popliteal lesions

- TASC A and D lesions: Endovascular therapy is the treatment of choice for type A lesions and surgery is the treatment of choice for type D lesions [C].
- TASC B and C lesions: Endovascular treatment is the preferred treatment for type B lesions and surgery is the preferred treatment for good-risk patients with type C lesions. The patient's co-morbidities, fully informed patient preference and the local operator's long-term success rates must be considered when making treatment recommendations for type B and type C lesions [C].

# Last Strategy in treating patients with PAD

## *Major Amputation*

Primary vs Secondary  
BKA vs AKA





# Take home message

- PAD is a marker for **systemic** atherosclerosis
- PAD is associated with **increased risk** of cardiovascular mortality and morbidity
- Majority of patients with PAD are **asymptomatic**
- Proven **risk reduction therapy** should be prescribed for patients with PAD
- Revascularization** procedures for CLI are indicated in all patients to prevent limb loss except in terminal cases



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# Thank You