

# **Peripheral- vascular disease Lower Limb Ischemia**

Prof Moaath Alsmady

# Chronic Lower Limb Ischemia

## Definition:

- It is the decrease in arterial blood supply to the tissues due to partial occlusion of arteries
- Stenosis or occlusion produces symptoms & signs that are related to the organ supplies by the artery.
- The severity of symptoms is related to the size of the vessel occluded & alternative routes (collaterals) available for blood flow.

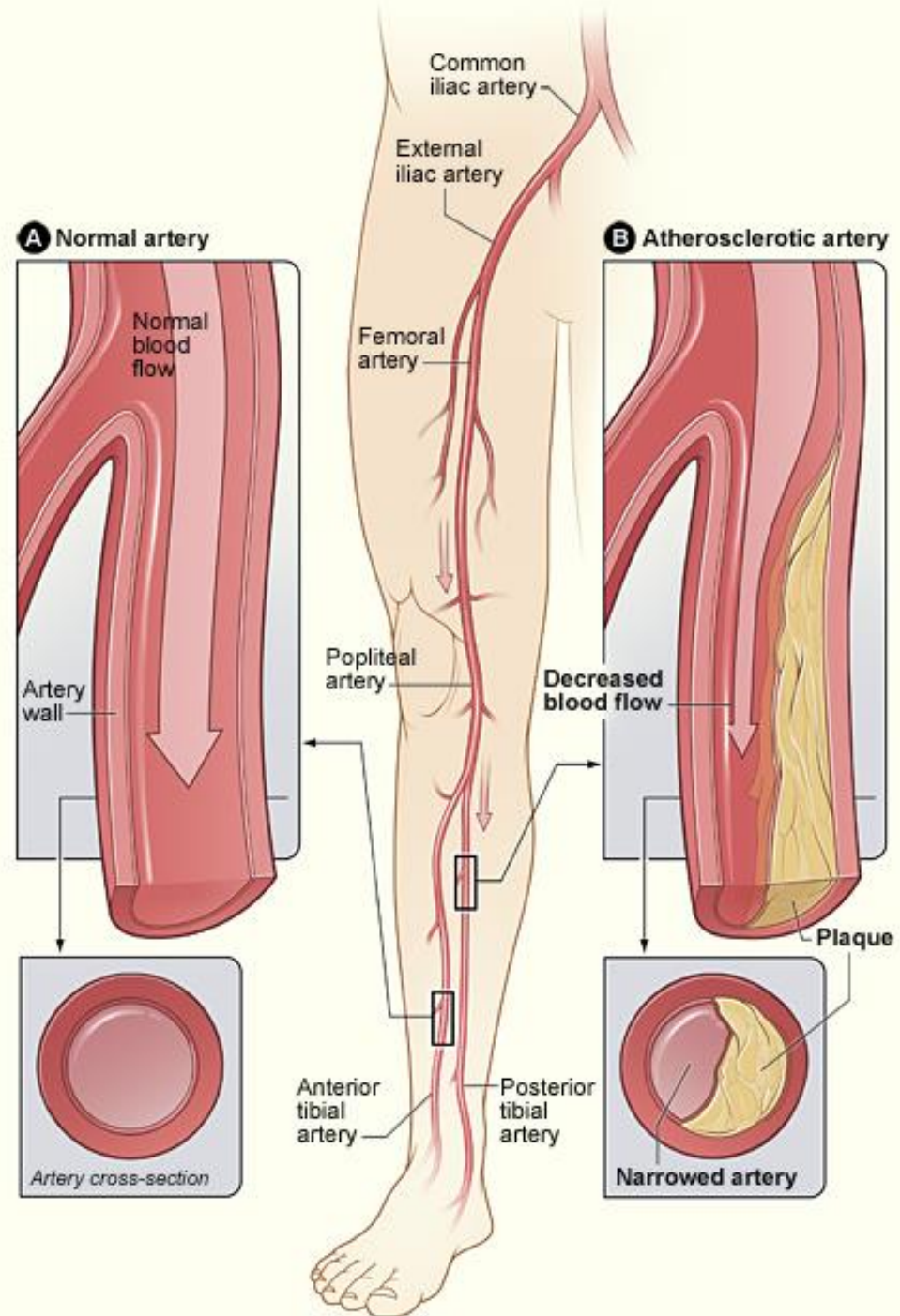
# What is PVD?

## Definition:


- Also known as PAD or PAOD.
- Occlusive disease of the arteries of the lower extremity.
- Most common cause:
  - Atherothrombosis
  - Others: arteritis, aneurysm + embolism.
- Has both ACUTE and CHRONIC Px

## Pathophysiology:

- Arterial narrowing → Decreased blood flow = Pain
- Pain results from an imbalance between supply and demand of blood flow that fails to satisfy ongoing metabolic requirements.



# The Facts:

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1. The prevalence: >55 years is 10%-25%
  2. 70%-80% of affected individuals are asymptomatic
  3. Pt's with PVD alone have the same relative risk of death from cardiovascular causes as those CAD or CVD
  1. PVD pt's = 4X more likely to die within 10 years than pt's without the disease.
  2. The ankle-brachial pressure index (ABPI) is a simple, non-invasive bedside tool for diagnosing PAD – an ABPI <0.9 = diagnostic for PAD
  1. Patients with PAD require medical management to prevent future coronary and cerebral vascular events.
  1. Prognosis at 1 yr in patient's with Critical Limb Ischemia (rest pain):
    - Alive with two limbs — 50%
    - Amputation — 25%
    - Cardiovascular mortality 25%

There are currently insufficient data to recommend routine population screening for asymptomatic PAD using the ABPI.

- In recent years, it has become evident that PAD is an important predictor of substantial coronary and cerebral vascular risk

*Patients with symptomatic PAD have a 15-year accrued survival rate of about 22%, compared with a survival rate of 78% in patients without symptoms of PAD.*

*Patients with critical leg ischaemia, who have the lowest ABPI values, have an annual mortality of 25%*

# Risk Factors:

## Typical Patient:

- Smoker (2.5-3x)
- Diabetic (3-4x)
- Hypertension
- Hx of Hypercholesterolemia/AF/IHD/CVA



- Age  $\geq$  70 years.
- Age 50 - 69 years with a history of smoking or diabetes.
- Age 40 - 49 with diabetes and at least one other risk factor for atherosclerosis.
- Leg symptoms suggestive of claudication with exertion or ischemic pain at rest.
- Abnormal lower extremity pulse examination.
- Known atherosclerosis at other sites (eg, coronary, carotid, or renal artery disease).

Patients at risk — Based in part upon the above observations, the 2005 American College of Cardiology/American Heart Association (ACC/AHA) guidelines on PAD, which were produced in collaboration with major vascular medicine, vascular surgery, and interventional radiology societies, identified the following groups at risk for lower extremity PAD

Risk Factors:

Atherosclerosis (same as RF's for CAD and CVD)

Smoking (2.5-3x)

Diabetes 3-4x

Hypertension, increased age >50, male and family history

RARE: homocysteinuria

# Chronic PVD History:

## 1. INTERMITTENT CLAUDICATION

- Derived from the Latin word ‘to limp’
- “Reproducible pain on exercise which is relieved by rest”
- Pain can also be reproduced by elevating the leg
- “my legs get sore at night and feel better when I hang them over the edge of the bed”

## 2. Other Symptom/Signs:

- A burning or aching pain in the feet (especially at night)
- Cold skin/feet
- Increased occurrence of infection
- Non-healing Ulcers
- Asymptomatic

## 3. Critical Stenosis = >60%, impending acute ischemic limb:

- rest pain
- ischemic ulceration
- gangrene





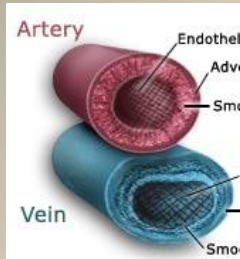
Asymptomatic — 20 to 50 percent \*\* Unfortunately, however, a PAD diagnosis can be missed since nearly 50% of patients are asymptomatic or have atypical symptoms. Thus, a high index of suspicion is necessary in patients presenting with potential risk factors.

Classic claudication — 10 to 35 percent

Critical limb ischemia — 1 to 2 percent

Cramp or tingling which recurs on walking the same distance

# DDx of Leg Pain



## 1. Vascular

- a) DVT (as for risk factors)
- b) PVD (claudication)



## 2. Neurospinal

- a) Disc Disease
- b) Spinal Stenosis (Pseudoclaudication)



## 3. Neuropathic

- a) Diabetes
- b) Chronic EtOH abuse




## 4. Musculoskeletal

- a) OA (variation with weather + time of day)
- b) Chronic compartment syndrome

Osteoarthritis of the hip or knee joints — Osteoarthritis can be distinguished clinically from aortoiliac disease because osteoarthritic pain may not disappear promptly after exercise, may be associated with weather changes, and may vary in intensity from day to day (usually worse in the morning or upon wakening)

Neurogenic claudication — Neurogenic claudication, also called pseudoclaudication, describes a pain syndrome due to lumbar neurospinal canal compression, which is usually due to osteophytic narrowing of the neurospinal canal. The clinical presentation often helps to distinguish vasculogenic (ie, true) claudication from pseudoclaudication. Unlike true claudication, which occurs with walking and is relieved by stopping, pseudoclaudication causes pain with erect posture (lumbar lordosis) and is relieved by sitting or lying down. Patients with pseudoclaudication may also find symptomatic relief by leaning forward and straightening the spine (usually done with pushing a shopping cart or leaning against a wall). (See "Lumbar spinal stenosis: Pathophysiology, clinical features, and diagnosis".)

# Physical Examination:




Examination:	What do to:
Inspection	<ul style="list-style-type: none"><li>• Thick Shiny Skin</li><li>• Hair Loss</li></ul>
Expose the skin and look for:	<ul style="list-style-type: none"><li>• Brittle Nails</li><li>• Colour Changes (pallor)</li><li>• Ulcers</li><li>• Muscle Wasting</li></ul>
Palpation	<ul style="list-style-type: none"><li>• Temperature (cool, bilateral/unilateral)</li><li>• Pulses: ?Regular, ?AAA</li><li>• Capillary Refill</li><li>• Sensation/Movement</li></ul>
Auscultation	<ul style="list-style-type: none"><li>• Femoral Bruits</li></ul>
Ankle Brachial Index (ABI)	= <u>Systolic BP in ankle</u> Systolic BP in brachial artery
Buerger's Test	<ul style="list-style-type: none"><li>• Elevate the leg to 45° - and look for pallor</li><li>• Place the leg in a dependent position 90° &amp; look for a red flushed foot before returning to normal</li><li>• Pallor at &lt;20° = severe PAD.</li></ul>

Auscultate for femoral (1/2 way between the ASIS and pubic symphysis)

# Pulses and ABPI



# What does the ABI mean?



ABI	Clinical Correlation
>0.9	Normal Limb
0.5-0.9	Intermittent Claudication
<0.4	Rest Pain
<0.15	Gangrene

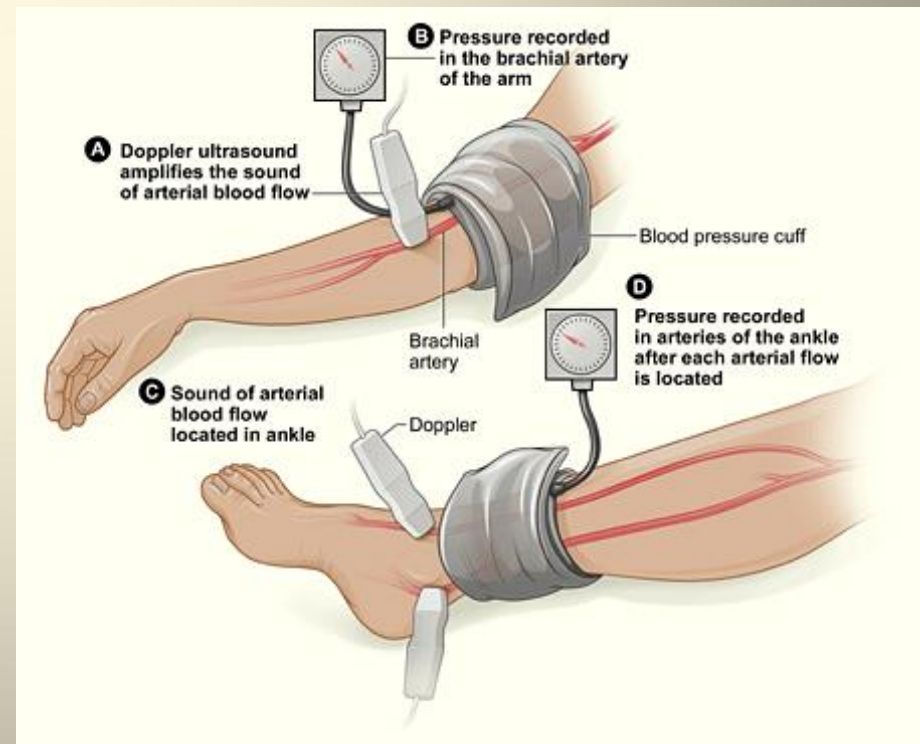
## **CAUTION:**

Patient's with Diabetes + Renal Failure:  
They have calcified arterial walls which can falsely elevate their ABI.

Take the highest measurement in both limbs

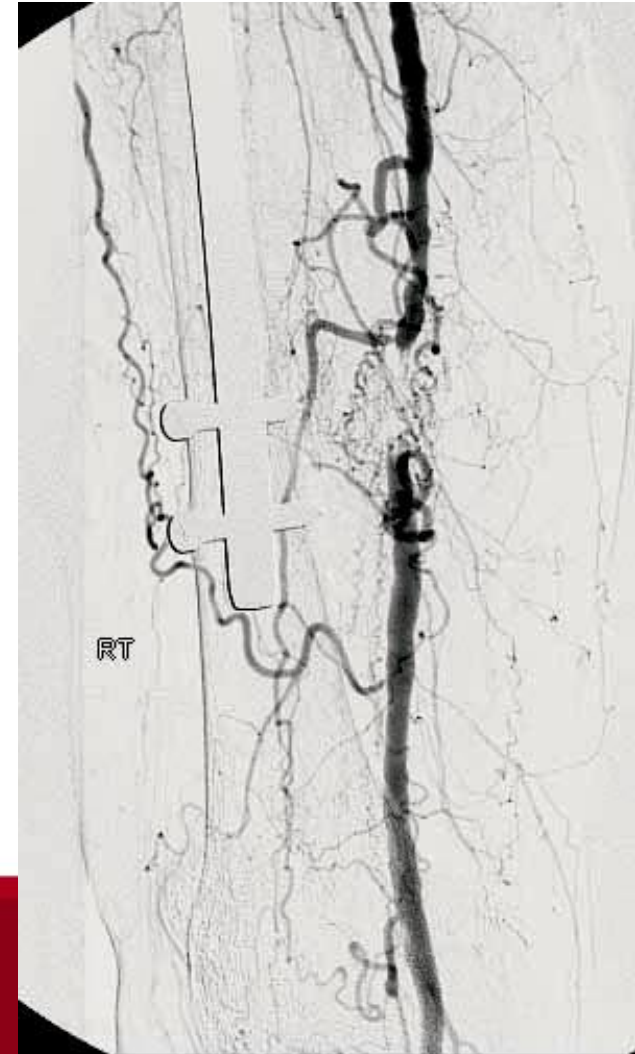
low ABI is also predictive of an increased risk of all-cause and cardiovascular mortality [39,40] and of the development of coronary artery calcification

95% sensitive in detecting angiogram positive disease and around 99% specific in identifying supposedly healthy subjects



# Investigations

- Ankle Brachial Index
- Duplex ultrasound
- Ct angio/Angiogram





# Common sites of plaque formation in arteries

- Branch points.
- Tethered sites like in superficial femoral artery in Hunter's canal in the leg

# Symptoms

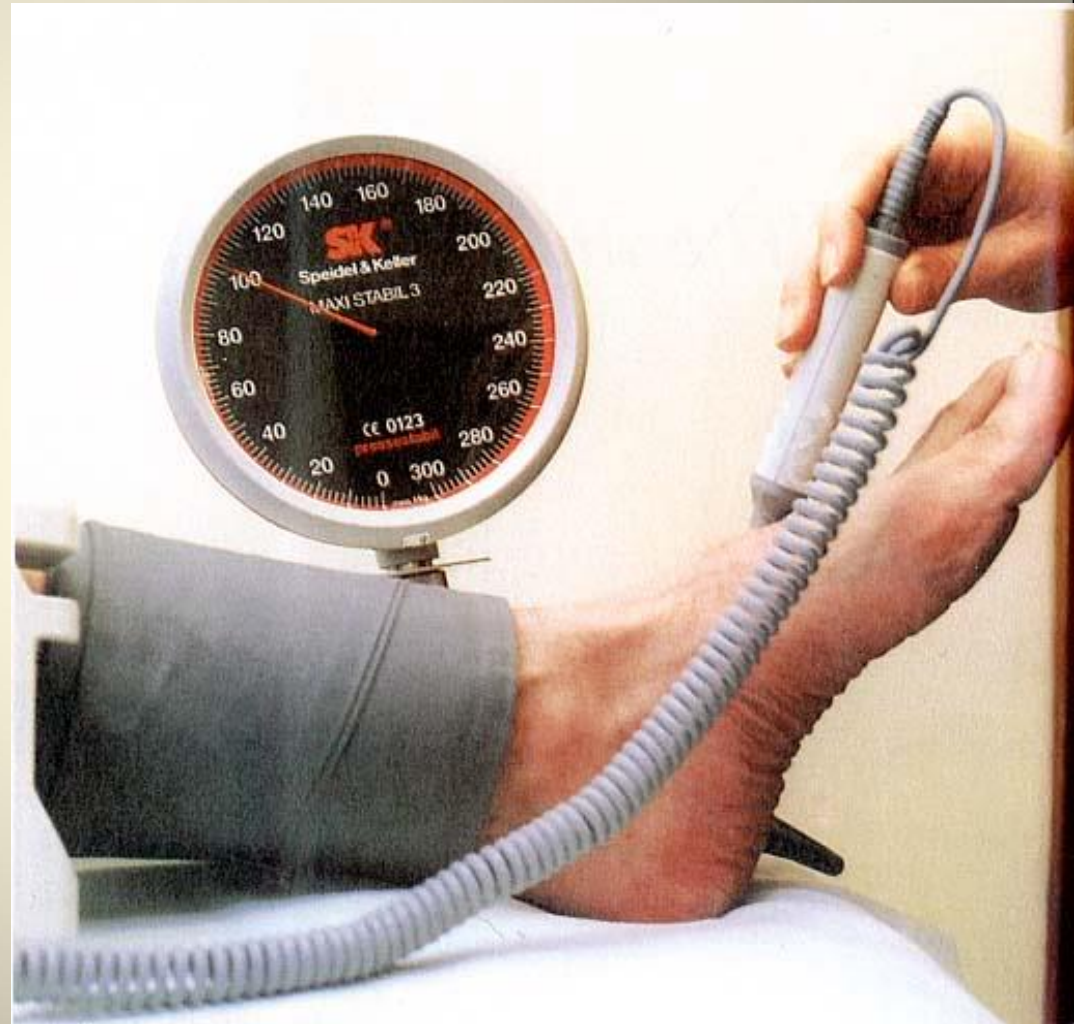
- Intermittent claudication
- Rest pain
- Erectile dysfunction
- Sensorimotor impairment
- Tissue loss

# Signs

- Muscular atrophy
- Decrease hair growth
- Thick toenails
- Tissue necrosis ulcers infection
- Absent pulses
- Bruits

# Intermittent claudication

- **ABI:** 0.5-0.9
- Claudication distance
- Calf is the most common



# 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 diabetic

# Rest pain

- Worst at night, lying, relieved by putting the leg in dependent site
- Coldness
- Numbness
- Parasthesia
- Color change
- Differentiated from night cramps

# Ulcers and gangrene

- Gangrene Between the toes
- Ulcers at the foot dorsum and leg shins

<b>Aortoiliac</b>	Claudication of both buttocks, thighs and calves, femoral and distal pulses absent, bruits, impotence
<b>Iliac</b>	Unilateral claudication of thigh, calf Unilateral absence of femoral and distal pulses
<b>femoropopliteal</b>	Unilateral claudication in calf, femoral pulse palpable with absent unilateral distal pulses
<b>Distal obstruction</b>	Femoral & popliteal pulses palpable, ankle pulses absent, claudication in calf & foot



# Treatment Options

## ■ Medical

- Risk Factor Modification\*
- Exercise Therapy\*
- Drug Therapy\*

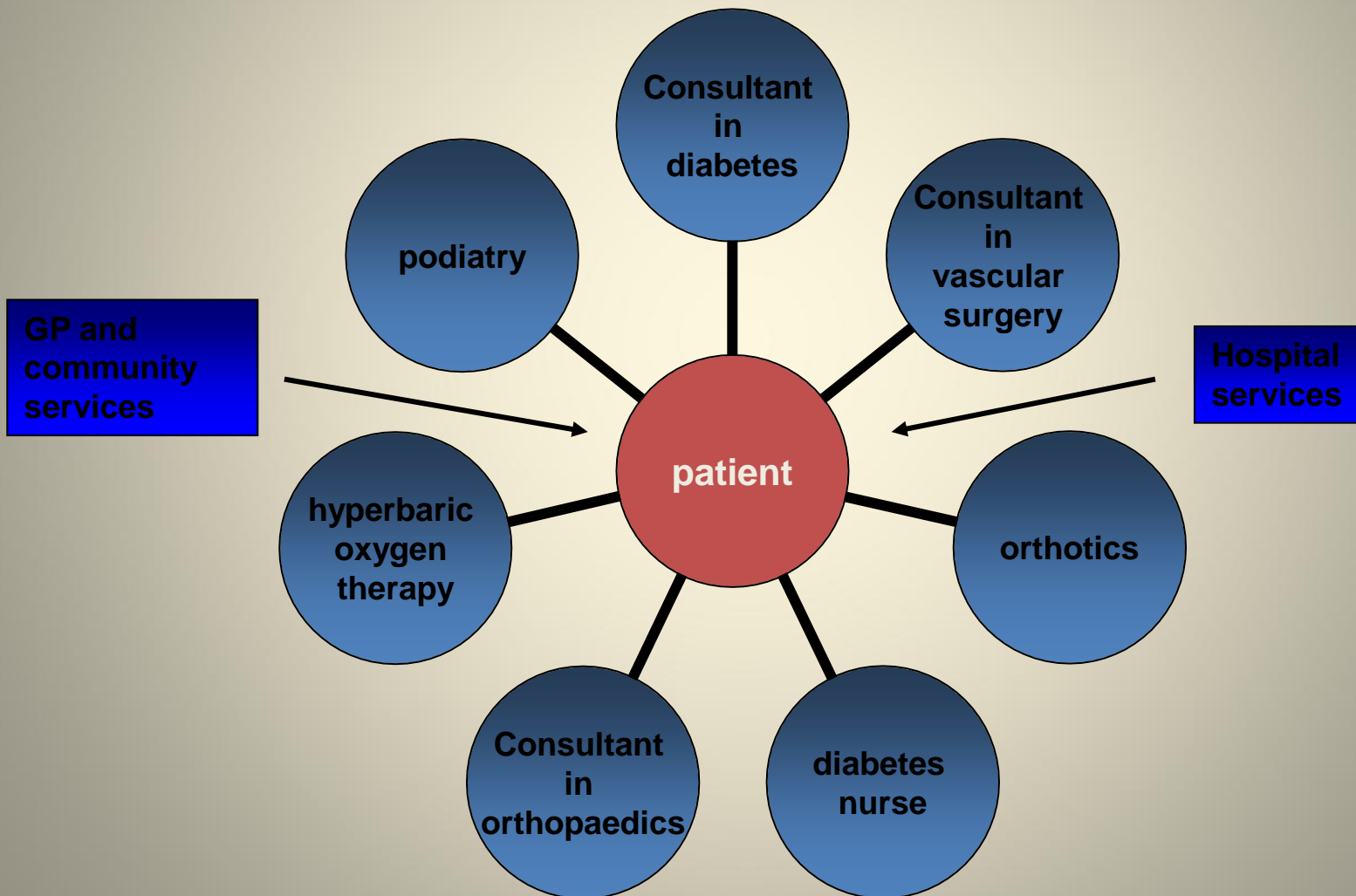
## ■ Endovascular Therapy

- Peripheral Transluminal Angioplasty\*
- Peripheral Stenting\*
- Atherectomy
- Thrombolytic Therapy (adjunctive)
- Laser

## ■ Surgery

- Bypass grafts\*
- Amputation\*
- Endarterectomy

# Multidisciplinary teamwork with holistic approach



# Lifestyle Modification and Secondary Prevention

- cessation of smoking is by far the **single most important factor** determining the outcome of patients with PAD
- Oral hypoglycemic therapies are usually required to achieve the (HbA1C) goal of **<7%** when baseline serum glucose is in the range of **140–180 mg/dl**.
- Insulin therapy is usually required to achieve HbA1C goals when fasting glucose **is >180 mg/dl**

- maintaining an LDL level  $<100$  mg/dl ( $<2.6$  mmol/L) is strongly recommended.
- \* lowering total cholesterol and LDL by 25% with statin therapy reduces cvs mortality and morbidity in PAD patients by 21% irrespective of age, sex, or baseline cholesterol level. (Heart Protection Study )
- The use of (ACE) inhibitors may confer more protection against cardiovascular events
- \* safety using of beta-blocker PAD patients, except in the most severely affected patients with CLI (meta-analysis of randomized, controlled trials)

# Antithrombotic Therapy

- lifelong aspirin therapy (75–150 mg/d) is recommended. (meta-analysis of 9706 patients with PAD)
- Clopidogrel may be **superior** to aspirin in reducing serious vascular events in PAD patients. (CAPRIE) trial
- oral anticoagulation improves graft patency in **venous conduit**, whereas aspirin gives better results for **non venous, prosthetic grafts** (Dutch multicenter randomized trial)
- antiplatelet agents still remain the recommended agent in the majority of patients undergoing (uncomplicated) **infrainguinal** vascular reconstructive surgery. Exceptions are patients with femoro-distal bypass procedures, who may be at increased risk for graft thrombosis.

# Catheter-Based Revascularization

- Indication:
- lifestyle-disabling IC
- severe arterial insufficiency associated with tissue loss that may not heal without revascularization.
- CLI that jeopardizes viability of the lower limb.

- Short occlusion of left popliteal artery , treated by percutaneoustransluminal angioplasty.

A



- Short occlusion of left popliteal artery. The balloon catheter is passed through the occlusion over a guidewire and inflated





C POST DILATION

- Short occlusion of left popliteal artery. The balloon catheter is passed through the occlusion over a guidewire and inflated

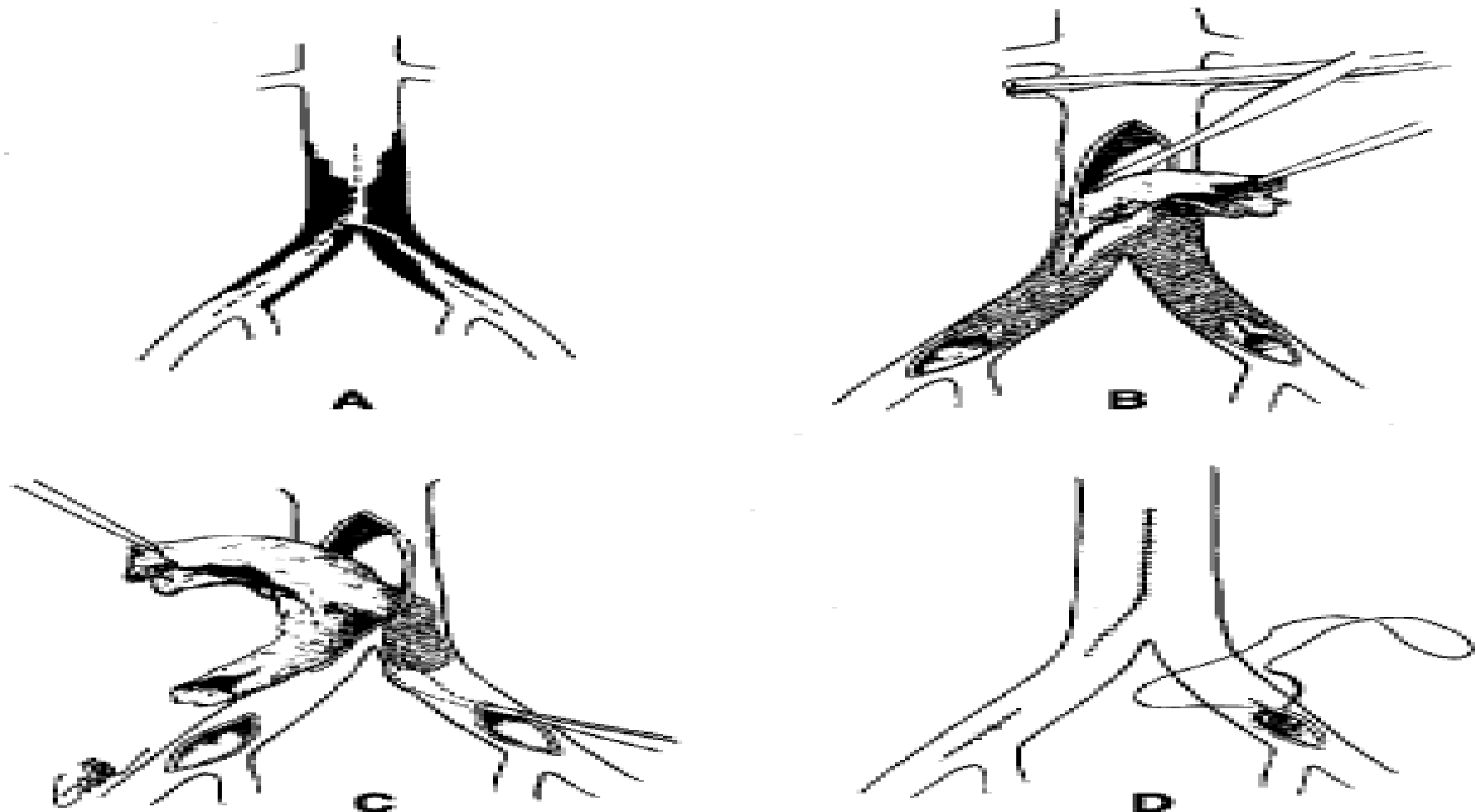


# indications for Operation

- Ischemic pain at rest
- actual tissue necrosis, including ischemic ulcerations or frank gangrene, as indicative of advanced ischemia and threatened limb loss.
- claudication that jeopardizes the livelihood of a patient or significantly impairs the desired lifestyle of an otherwise low-risk patient, assuming that a favorable anatomic situation for operation exists

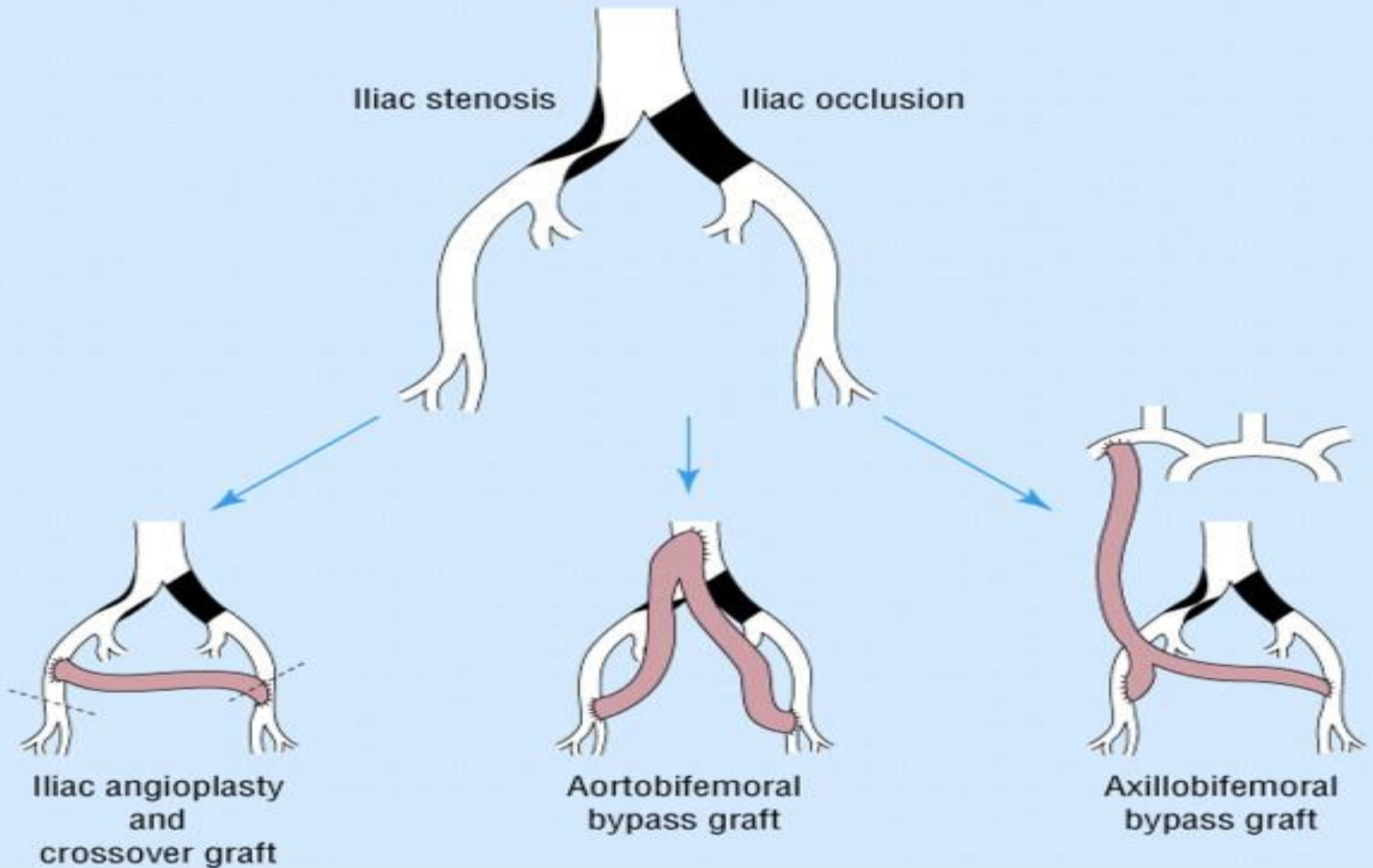
# Direct Operative Procedures

- *Aortoiliac Endarterectomy*
- approximately 5 % to 10 % of patients with truly localized disease.
- advantages:
  - 1. no prosthetic material is inserted;
  - 2. the infection rate is nonexistent;
  - 3. inflow to the hypogastric arteries, potentially improving sexual potency in the male,

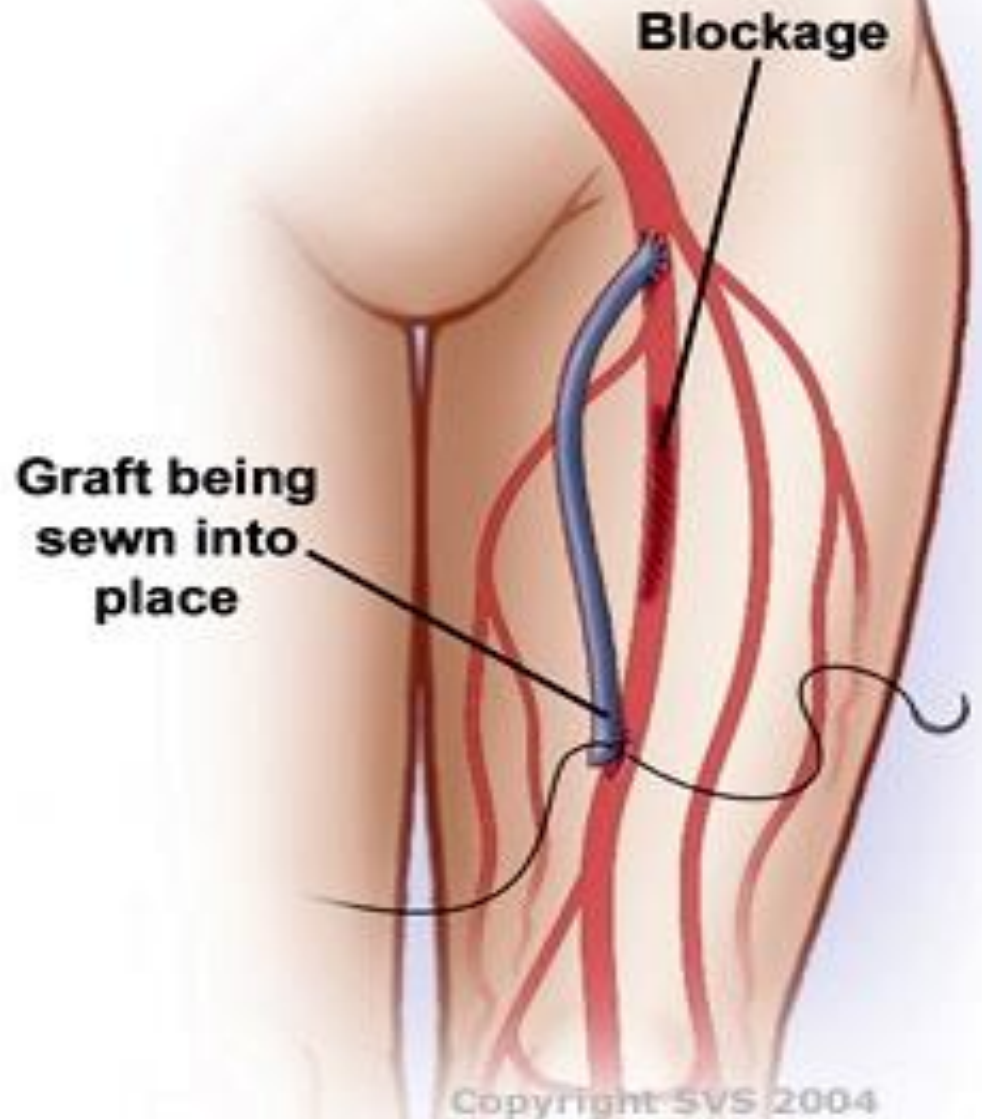


**FIGURE 40.5** Aortoiliac endarterectomy. (A) Occlusive disease limited to distal aorta and common iliac arteries, with location of arteriotomies indicated by dotted lines. (B) A satisfactory endarterectomy plane is achieved, and the atheromatous material removed from the aorta from the level of the proximal clamp to the bifurcation. (C) Satisfactory end point of the endarterectomy is achieved at the iliac bifurcation, and endarterectomy continued proximally. Tacking sutures may be necessary to secure an adequate end point. (D) Closure of arteriotomies to complete procedure. See text for details.

# BYPASS SURGERY



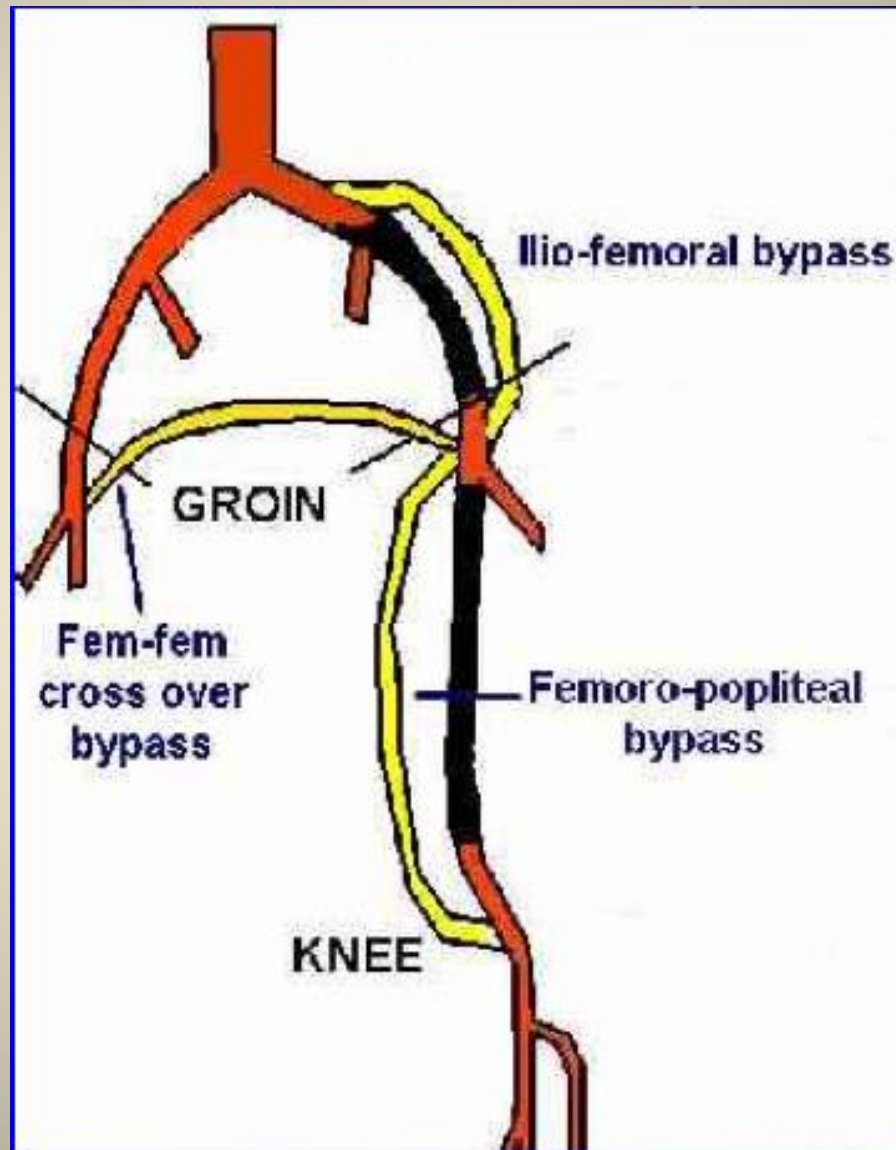
- Femoro-popliteal bypass



- **Femoro-distal or femoro-crural bypass**
- these grafts originate from the femoral artery at the groin and take blood to one of the 3 calf blood (anterior and posterior tibial arteries and peroneal artery).



# Some Bypass Options:





# Postoperative Complications

- Early complication
- Postoperative hemorrhage (severe enough to require reoperation is seen in only 1% to 2% of patients),
- Acute aortofemoral graft limb occlusion (may occur in 1% to 3% of patients)
- Acute renal failure
- Acute postoperative bowel and spinal cord ischemia
- Acute limb ischemia "trash foot,"

# Late Complications

- Graft occlusion secondary to recurrent obliterative disease (remains the most common late complication, reported in from 5% to 10% of patients at 5 years and 15% to 30% of patients followed 10 years or more )
- Failure of the entire reconstruction will require another aortofemoral graft if the patient is an appropriate candidate , or extra-anatomic reconstruction for those patients felt to be less suitable for extensive reoperative surgery
- Pseudoaneurysm (3% to 5%of patients),
- Postoperative iatrogenic impotence may occur in up to one-quarter of patients
- Late graft infection
- Aortoenteric fistula formation

# Amputation

- INDICATION
- unreconstructable peripheral vascular disease,
- fixed flexion deformities
- extensive tissue loss

