

Lower Extremity Amputation in Peripheral Artery Disease

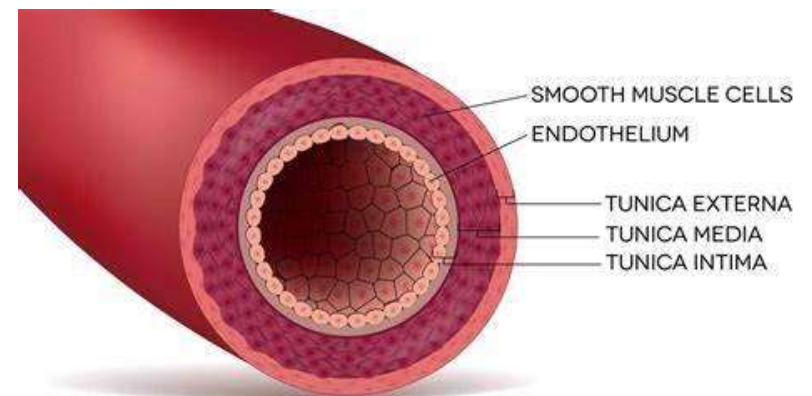
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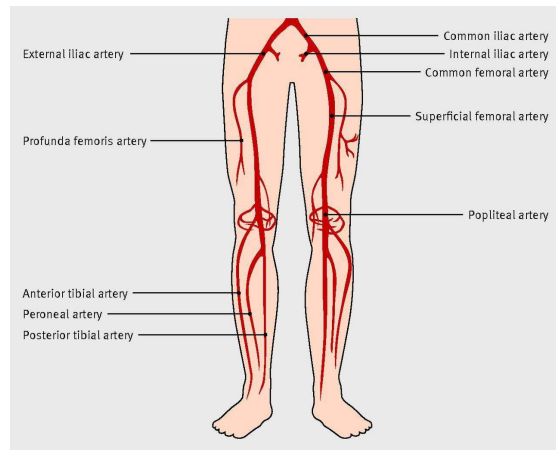
Objectives

1. Outline risk factors for limb amputation with diagnosis of PAD.
2. Understand goals of perioperative care for patients after major amputation.

Peripheral Artery Disease

- 4 Atherosclerotic disease of non-coronary and non-cerebral arteries
- 4 Arterial stenosis/occlusion caused by intimal thickening, fibroatheroma, calcified plaques, and/or thrombus
- 4 More common in lower extremities than upper extremities
- 4 Prevalence
 - o 5% of patients over 40 years old
 - o 15-20% of patients over 70 years old



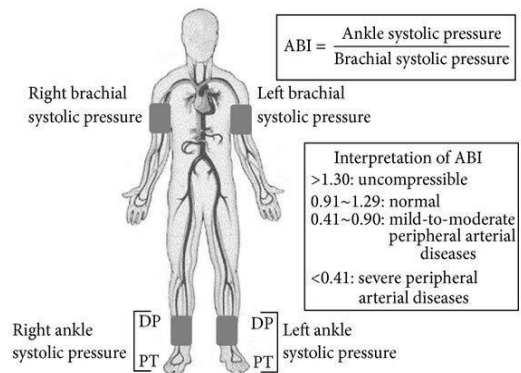


Diagnosis

4 ABI < 0.9

4 Other diagnostic tools

- Physical exam
- US
- CTA/MRA
- Angiography



PAD Risk Factors

- 4 Smoking
- 4 Diabetes
- 4 Hypertension
- 4 Hyperlipidemia
- 4 Chronic kidney disease
- 4 Advanced age
- 4 Genetics

Smoking and PAD

- 4 4x more likely to be symptomatic
- 4 3x more likely to have failure of stent/bypass
- 4 Smoking causes vasomotor dysfunction, inflammation, and lipid dysfunction leading to plaque formation
- 4 Commonly affects proximal vessels

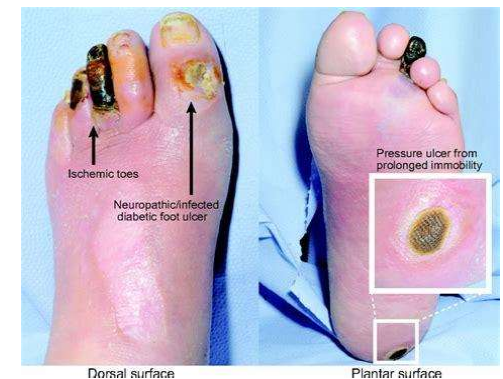
Diabetes and PAD

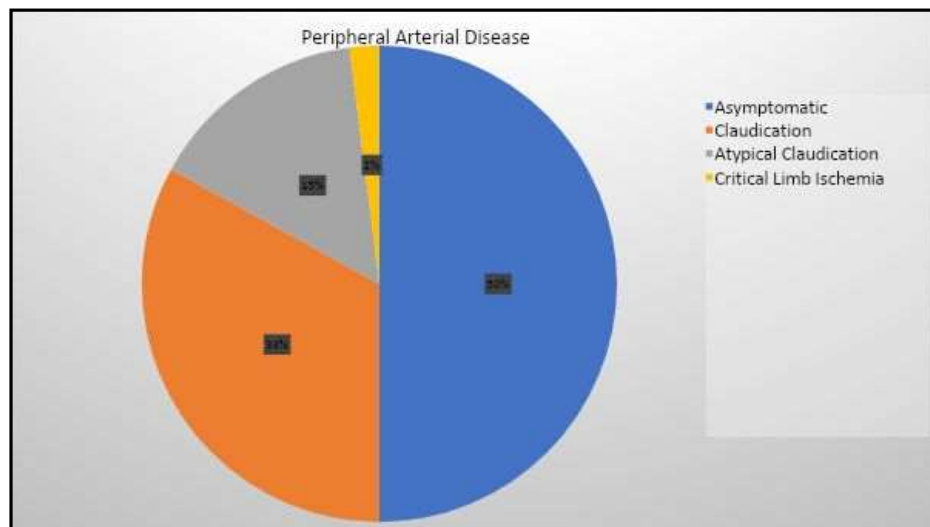
- 4 1/3 of PAD patients have diabetes
- 4 Inflammation, coagulation, vasoconstriction and endothelial dysfunction associated with diabetes
- 4 10x more likely to require major amputation
- 4 Commonly affects tibial arteries and causes small vessel disease

	Patients with PAD without T2DM	Patients with PAD with T2DM
Anatomy	Proximal arteries, focal pattern, collateralization	Distal arteries, bilateral disease, multifocal disease, impaired collateralization
Clinical Features	Intermittent claudication, slower progression	Asymptomatic, wounds, increased risk of infection, faster progression
Diagnosis	ABIs are predictable	ABIs may be falsely elevated
Treatment	Treatment is predictable	Less responsive to some intervention, aggressive medical management

PAD Signs and Symptoms

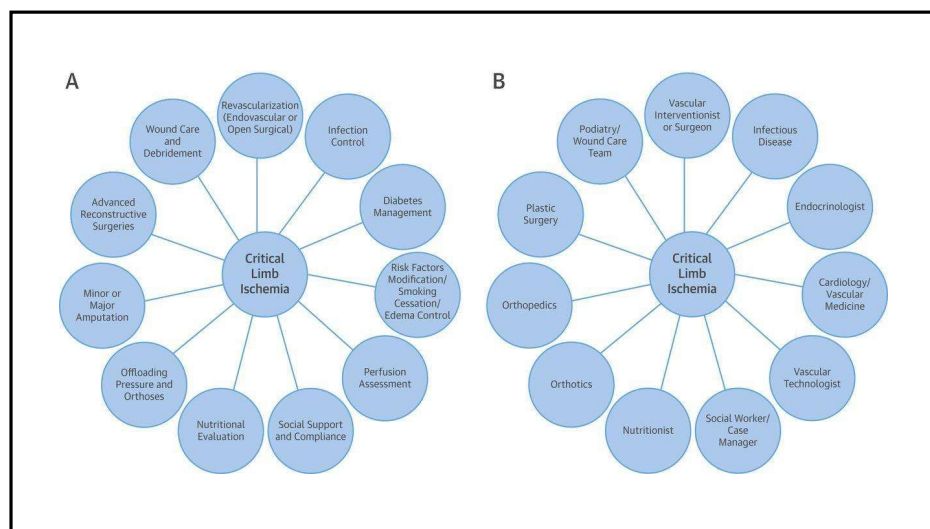
- 4 Asymptomatic
- 4 Intermittent claudication
- 4 Rest pain
- 4 Ulceration or gangrene





Critical Limb Ischemia

- 4 Ischemic rest pain x 2 weeks
- 4 Ulcers or gangrene that is attributable to objectively proven arterial occlusive disease
- 4 12% of patients with CLI will require major amputation in 3 months



Acute Limb Ischemia

- 4 Acute arterial thromboembolism
- 4 Trauma
- 4 Failure of bypass graft or stent
- 4 Common cause: new onset a fib, hypercoagulable state, stopping medications
- 4 Signs & symptoms: pain, pulslessness, pallor, poikilothermia, paresthesia, paralysis

TABLE 1. RUTHERFORD CLASSIFICATION OF ACUTE LIMB ISCHEMIA

Rutherford Class	Sensory Impairment	Motor Impairment	Doppler Signals
Class 1 (No immediate threat)	None	None	Arterial: audible Venous: audible
Class 2a (Marginally threatened)	Minimal	None	Arterial: audible Venous: audible
Class 2b (Immediately threatened)	Involves forefoot with possible rest pain	Mild to moderate	Arterial: absent Venous: present
Class 3 (Irreversible ischemia)	Insensate	Severe, rigorous	Arterial: absent Venous: absent

Adapted from Gunawansa N. Atraumatic acute limb ischemia: clinical presentation, classification, assessment and management- a review. Int J Vasc Surg Med. 2017;3:046-052. doi: 10.17352/2455-5452.000029

PAD Non-Surgical Treatment

4 Lifestyle and risk factor modification

- Smoking cessation
- Glycemic control
- Initiate antiplatelet and statin

4 Exercise program

4 Vasoactive medications

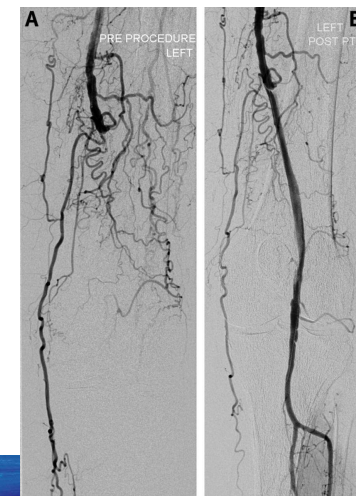
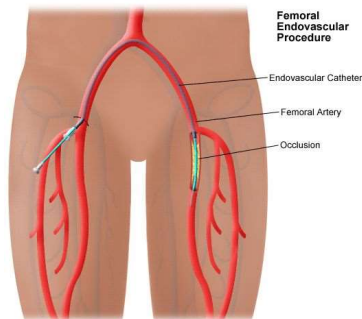
Endovascular Treatment

4 Peripheral angiogram

4 Intervention including stenting, balloon angioplasty, atherectomy, and intravascular lithotripsy

4 Usually common femoral arterial access

4 Will likely need to be on antiplatelet medications postoperatively



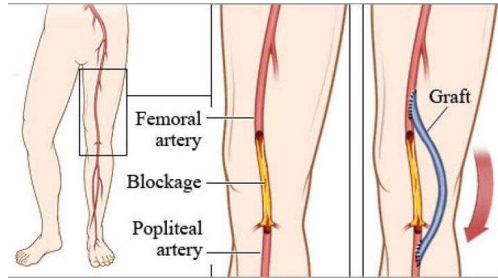
Open Surgical Treatment

4 Endarterectomy

- Manually cleaning out plaque and closing with a patch

4 Surgical bypass

- Rerouting blood flow to bypass blockages
- Use patient's leg vein, donor vein, or artificial graft



Acute Limb Ischemia Treatment

□ Thrombolysis vs Thrombectomy

- Thrombolysis:
 - Breakdown of the clot
 - Indicated if clot present <14 days and patient has neurologic function of leg as well as no bleeding history within last 6 weeks.
- Thrombectomy
 - Actual removal of the clot
 - Indicated for paralysis and concern for compartment syndrome

When is Amputation Necessary?

4 Unsalvageable limb

- No anatomic possibility of revascularization
- Medical comorbidities

4 Infection/osteomyelitis

4 Trauma

4 Malignancy

4 Frostbite gangrene

4 Compartment syndrome

4 Non-functional limb/deformity

Compartment Syndrome

- 4 Can occur after vascular interventions due to increased blood flow to the tissues, altering arteriovenous pressure gradient, causing increased compartment pressure, restricting local tissue perfusion, and causing cellular anoxia

4 Signs and Symptoms

- Ø Pain with passive stretch of muscles in the affected compartment (early finding)
- Ø Tense compartment with a firm "wood-like" feeling
- Ø Pallor from vascular insufficiency (uncommon)
- Ø Diminished sensation
- Ø Muscle weakness (onset within approximately two to four hours of ACS)
- Ø Paralysis (late finding)

- 4 Require urgent surgical intervention to prevent permanent damage

Level of Amputation

4 What level amputation?

- Perfusion
- Mobility
- Skin integrity and level of tissue destruction

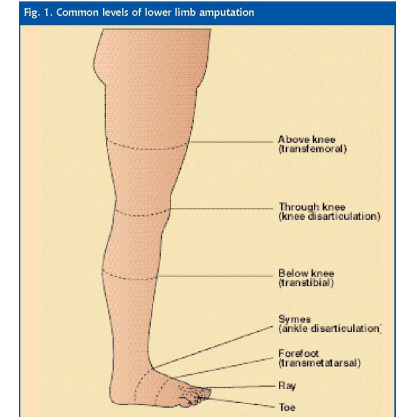
Level of Amputation

4 Minor Amputation

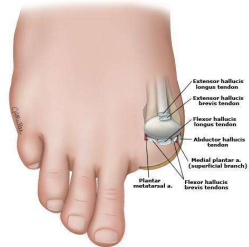
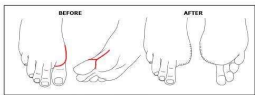
- Toe amputation
- Ray amputation
- Transmetatarsal amputation (TMA)

4 Major Amputation

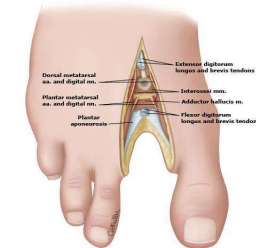
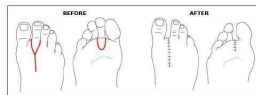
- Below knee amputation (BKA)
- Above knee amputation (AKA)



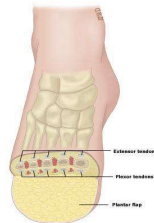
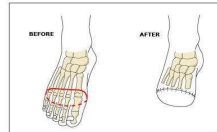
Toe



Ray



TMA



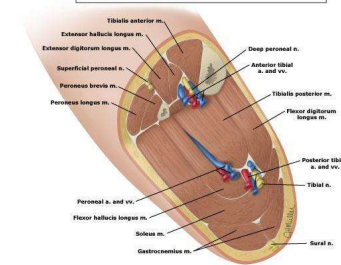
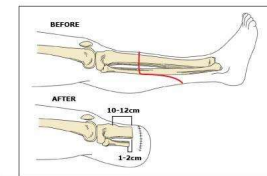
Below Knee Amputation

4 Posterior flap is most common

4 Intact knee joint makes mobility easier with prosthesis

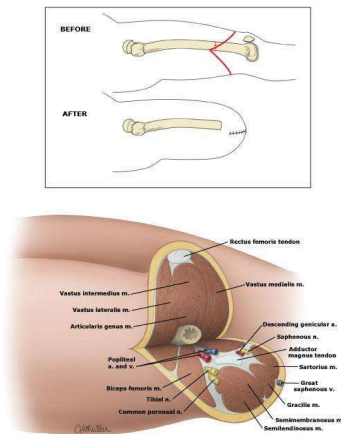
4 Intact profunda and iliac arteries needed to heal

4 10-20% will not heal and require AKA



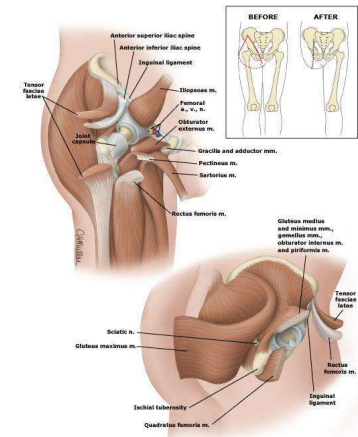
Above Knee Amputation

- 4 Middle to distal third of femur
- 4 Fish mouth incision
- 4 More intensive gait training required for prosthetic use
- 4 Higher healing rates and lower infection rates than BKA



Hip Disarticulation

- 4 Very uncommon
- 4 Reserved for instances when AKA doesn't heal
- 4 No prosthetic options



Staged Amputation

- 4 Necessary for infection control
- 4 Techniques: Guillotine vs disarticulation
- 4 Pros: lower postoperative infection risk, high primary healing rates
- 4 Cons: need for second procedure, prolonged hospitalization, pain with dressing changes

Amputation Surgical Techniques

- 4 Maintain sterility and use of effective draping
- 4 Tourniquet
- 4 Dissecting and properly ligating vessels
- 4 Sharp ligation of nerves
- 4 Irrigation of wound
- 4 Beveling bone
- 4 Closure of multiple layers without tension

Complications

- 4 Hematoma
- 4 Infection
- 4 Need for reamputation
- 4 Phantom limb pain
- 4 Contracture

Postop Amputation Pain Control

- 4 Perioperative Nerve Block
- 4 Surgical pain vs phantom pain
- 4 Multimodal pain regimen
 - Tylenol and NSAIDs (if applicable)
 - Neuropathic agents
 - Muscle relaxants
 - Narcotics

Postop Amputation Wound Care



- 4 Typically dressing change POD 2 and then daily for any drainage
- 4 Some serous/bloody drainage common first few days postoperatively
- 4 Staples/sutures remain in place longer than usual, typically 3-6 weeks
- 4 Limb protectors to be worn when transferring/working with therapies

Postop Amputation Mobility

- 4 Physical therapy
 - Single leg stand
 - Sit-to-stand
- 4 Limb protector recommended
- 4 Gait training after obtaining prosthesis
- 4 Limiting factors
 - Pain
 - Dementia
 - Baseline mobility and strength
 - Wound vac, IV antibiotics, assistive devices



Prosthesis

- 4 Wound needs to be fully healed prior to fitting
- 4 Use residual limb shrinker for 2-4 weeks for edema control
- 4 Custom prosthesis for each patient
 - Socket
 - Knee
 - Pylon
 - Foot



Long Term Prognosis After Major Amputation

- 4 25% of PVD patients use prosthesis outside of home after amputation
- 4 Non-ambulatory status prior to amputation, age > 70, dementia, other medical comorbidities contributed to non-ambulatory status post amputation
- 4 One year survival
 - 50-60% after AKA
 - 65-80% after BKA

Review

- 4 Poorly controlled diabetes can lead to small vessel disease and increase risk of major limb loss.
- 4 Main goals of postoperative care for amputees includes wound care, pain control, and mobility.

Questions?

References

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