Peripheral Arterial Disease

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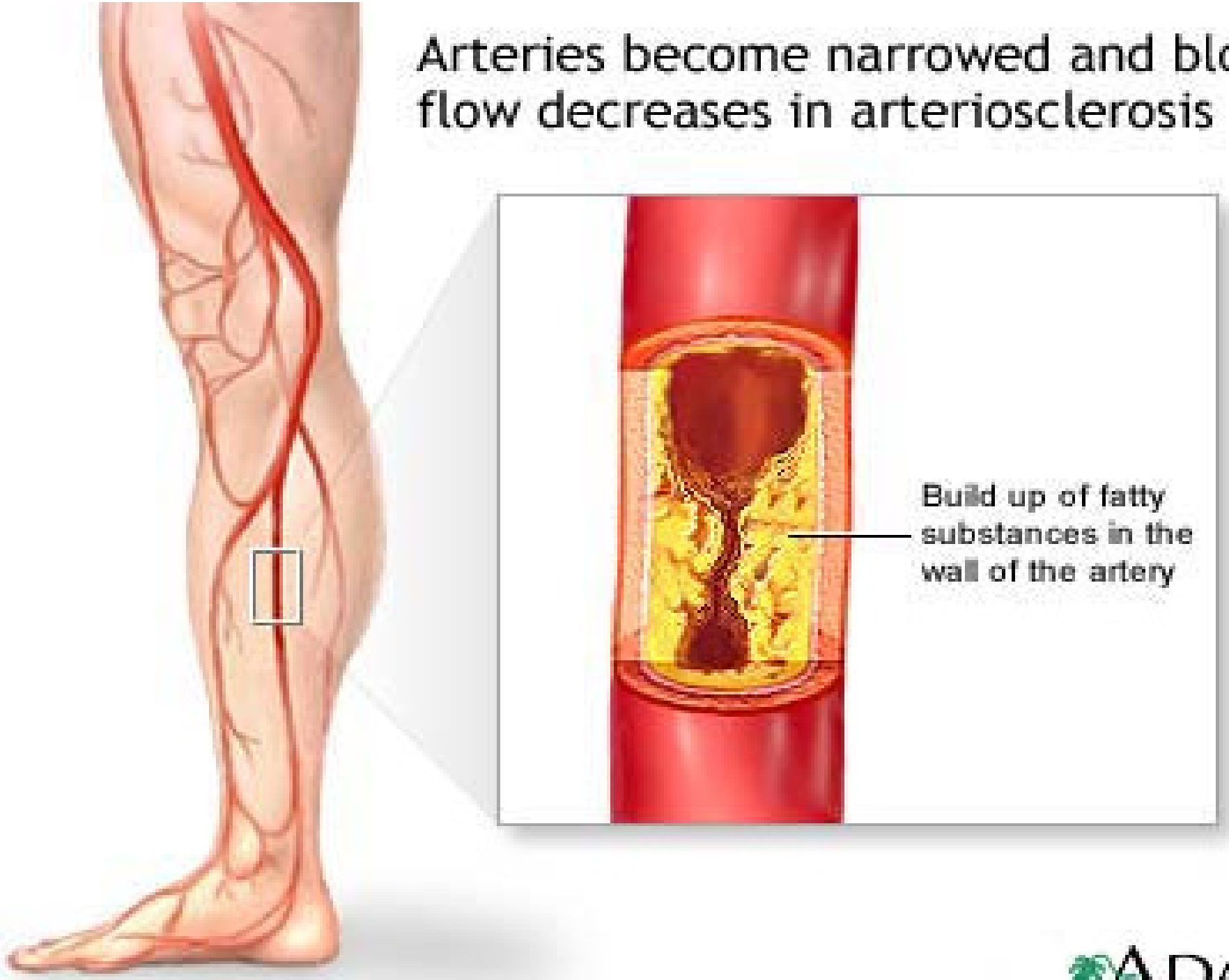
Definition

- Arteriosclerosis of the extremities is a disease of the blood vessels characterized by narrowing and hardening of the arteries that supply the legs and feet.
- This causes a decrease in blood flow that can injure nerves and other tissues.

Arteries become narrowed and blood flow decreases in arteriosclerosis



Etiology - Risk factors

- People are at higher risk if they have a
  - Personal or Family history of coronary artery disease (heart disease) or Cerebrovascular disease (Stroke)
  - Diabetes
  - Smoking
  - Hypertension
  - Kidney disease involving hemodialysis .
  - Hypercholesterolemia
  - Advanced Age
  - Male gender
  - Hypertriglyceridemia
  - Hyperhomocysteinemia
  - Sedentary Lifestyle

Pathogenesis

- Arteriosclerosis or "hardening of the arteries," commonly shows its effects first in the legs and feet.
- The narrowing of the arteries may progress to total closure (occlusion) of the vessel.
- The vessel walls become less elastic and cannot dilate to allow greater blood flow when needed (such as during exercise).
- Calcium deposits in the walls of the arteries contribute to the narrowing and stiffness.
- The effects of these deposits may be seen on ordinary X-rays.

Intermittent Claudication

- Latin word "*claudicatio*" = "to limp"
- Caused by PAD in the lower extremities
- Characterized by
  - Pain
  - Ache
  - Cramp
  - Tightness
  - Sense of fatigue in leg muscles with activity
- Symptoms relieved by rest
- Results in reduced mobility and quality of life

Pathogenesis of Claudication

Atherosclerosis in peripheral arteries of legs

↓

During exercise, oxygen demand increases in Muscles

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Anaerobic Metabolism In Muscles

↓

Produce Lactic acid

↓

Leg pain

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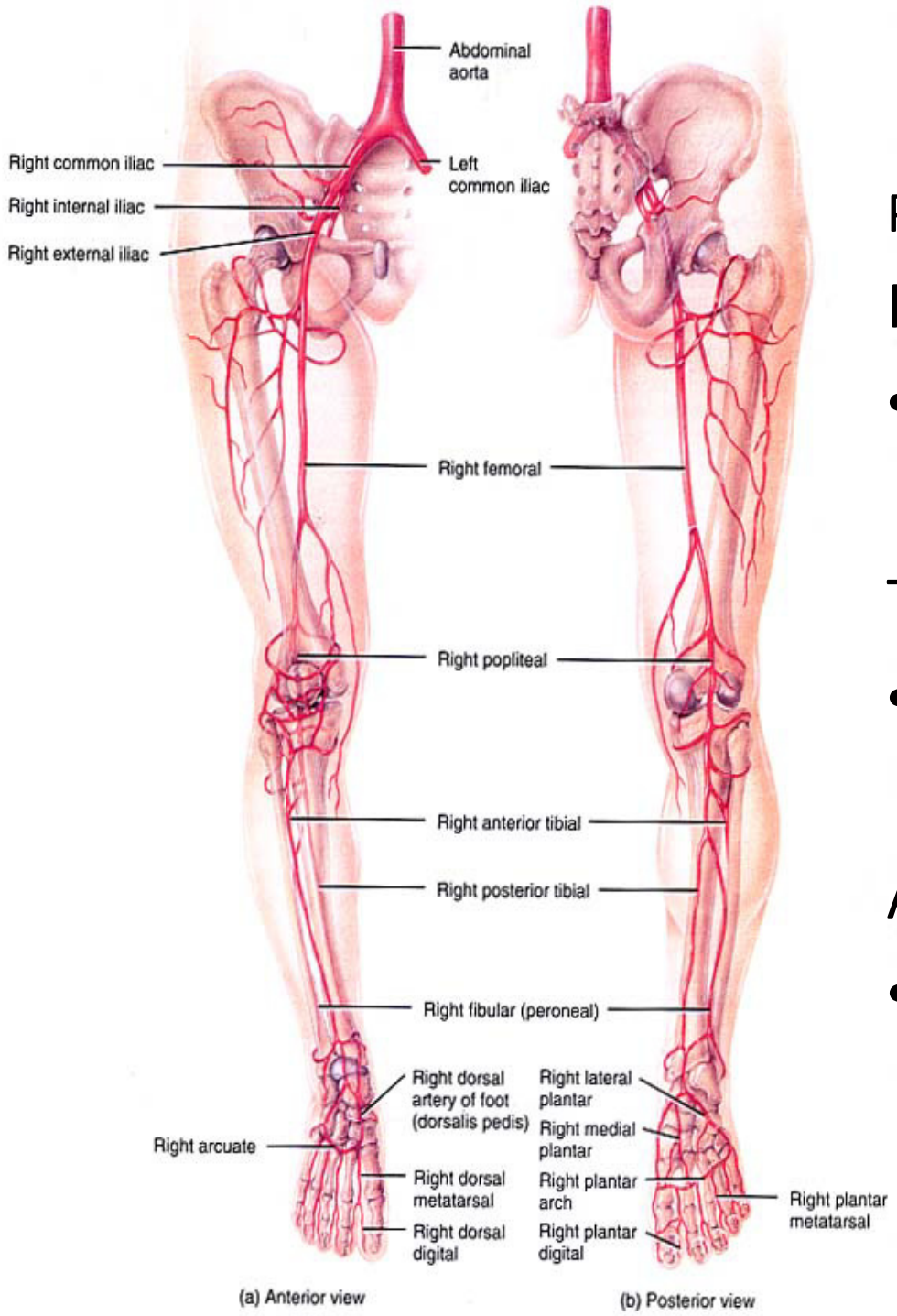
With Rest Lactic acid Washed away & Pain Relieved

Progression of Claudication

- Worsening claudication
- Non fatal cardiovascular disease
- Fatal cardiovascular disease
- 4 time increase risk of Myocardial infarction
- 2 – 3 time increase risk of cerebral stroke



PRIMARY SITES OF INVOLVEMENT

Femoral & Popliteal arteries:

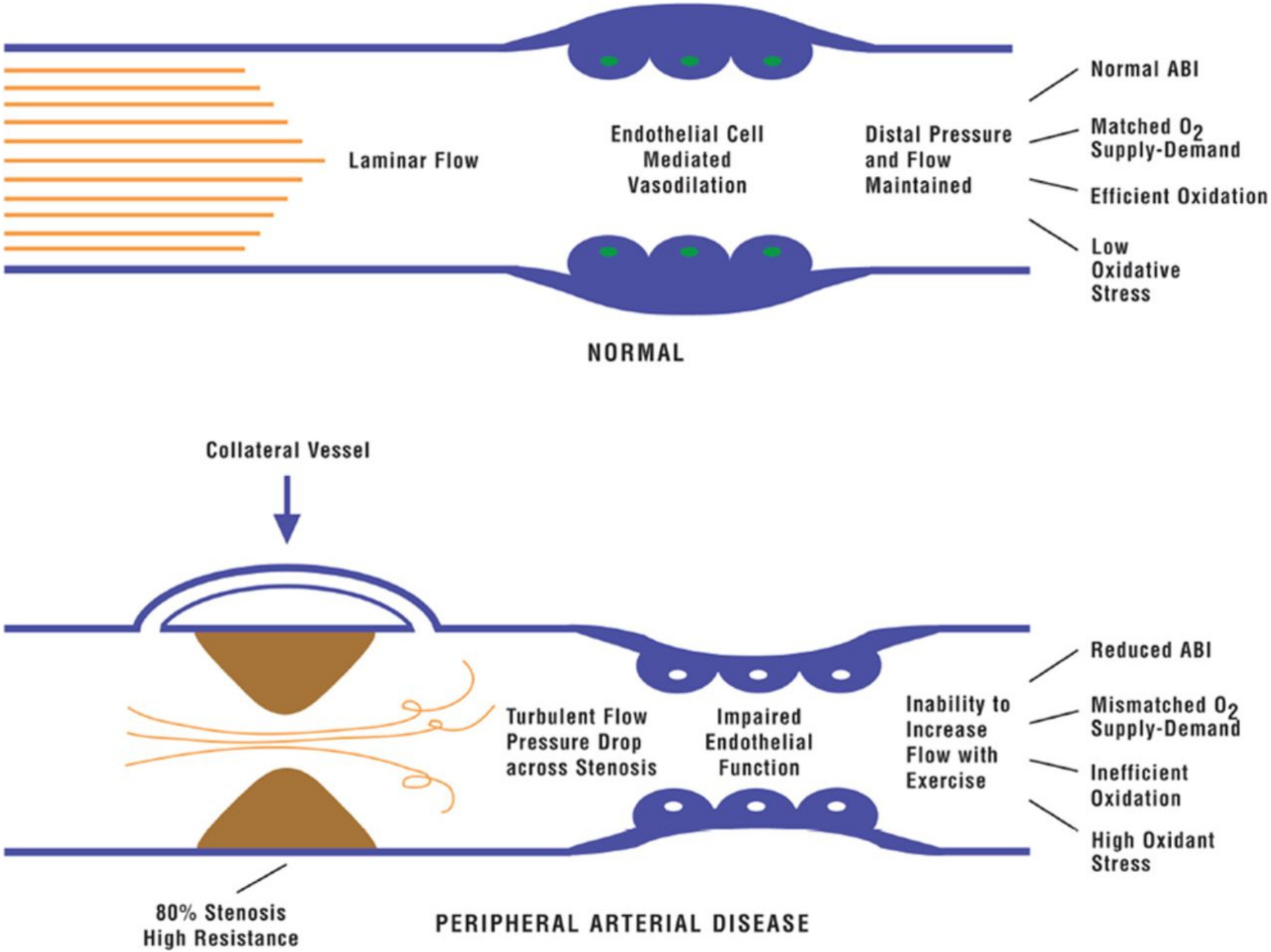
- 80-90%

Tibial & Peroneal arteries:

- 40-50%

Aorta & Iliac arteries:

- 30%


Laminar Flow
Endothelial Cell Mediated Vasodilation
Distal Pressure and Flow Maintained
Normal ABI
Matched O_2 Supply-Demand
Efficient Oxidation
Low Oxidative Stress
NORMAL
Collateral Vessel
Turbulent Flow Pressure Drop across Stenosis
Impaired Endothelial Function
Inability to Increase Flow with Exercise
Reduced ABI
Mismatched O_2 Supply-Demand
Inefficient Oxidation
High Oxidant Stress
80% Stenosis High Resistance
PERIPHERAL ARTERIAL DISEASE

Clinical Presentation of Intermittent Claudication

- Leg pain caused and reproduced by a certain degree of exertion
- Relieved by rest
- Not affected by body position
- Atherosclerotic lesions usually found in arterial segment one level above affected muscle group
- **Calf claudication**
  - More commonly due to disease in
    - femoral arteries
  - Less commonly due to disease in
    - Popliteal
    - proximal tibial
    - peroneal arteries;
- Hip/Thigh/Buttock claudication due to Aorto-Iliac disease

Differential Diagnosis

1. **Deep Venous Thrombosis**
   - Tight bursting pain
   - Dull ache
   - Worsens on standing
   - Resolves with leg elevation
   - Positional pain relief
2. **Chronic compartment syndrome**
3. **Nerve root compression**
4. **Arthritis**
5. **Spinal cord compression**

Investigation

- Routine blood tests
- Complete Blood Count
- Blood Urea
- Serum Creatinine
- Serum Electrolytes
- Investigation for Risk factors
  - Lipid profile
  - Coagulation tests
  - ECG to look for Arrhythmia, Valvular or Chamber Abnormality
- Specific Test
  - Ankle Brachial Pressure Index
  - Transcutaneous Oximetry
  - Colour doppler
  - MRI
  - Peripheral argiography

Ankle Brachial Pressure Index

$$\text{ABPI} = \frac{\text{Systolic Blood Pressure at Ankle}}{\text{Systolic Blood Pressure at Upper arm}}$$

ABPI value	Interpretation
above 1.2	Abnormal Vessel hardening from PVD
1.0 - 1.2	Normal range
0.90 - 0.99	Acceptable
0.80 - 0.89	Some arterial disease
0.50 - 0.79	Moderate arterial disease
under 0.50	Severe arterial disease

Transcutaneous Oximetry

- Non-invasive method
- Measure oxygen level of the tissue below the skin.
- Electrodes are placed on viable tissue on
    - Chest = As a control
    - Placed around the tissue in question (e.g. legs or feet).
- Normal oxygen tension in foot = 60 mmHg.
- Normal chest/foot ratio = 0.9.

Management

Life Style Modification

- Lower the extremity below the level of the heart.
- Encourage moderate amount of walking or graded extremity exercise.
- Discourage standing still or sitting for a long period of time.
- Maintain warm temperature and avoid chilling.
- Discourage nicotine use.
- Encourage the avoidance of constrictive clothing and accessory.
- Encourage avoidance of leg crossing.
- Instruct patient ways to avoid trauma.
- Encourage patient to wear protective shoes and padding for pressure area.

Medications Management

- Thrombolysis
  - Streptokinase
- Antiplatelet Medications
  - Aspirin
  - Ticlopidine
  - Clopidogrel
- Phosphodiesterase inhibitor medications
  - Cilostazol (Pletal)
  - Pentoxifylline (Trental)
- Management of Hypertension
- Management of Diabetes Mellitus
- Management of Hypercholesteremia

Surgical Management

- Thrombo -embolectomy
- Angioplasty
- Atherectomy
- Arterial Bypass Graphy
- Amputation

Atherectomy

Surgical procedure removing plaque material from the lining of an artery.