PERIPHERAL VASCULAR DISEASE

By: Rommel Luis C. Israel III

DEFINITION

- Thickening of the internal lining of the artery
  - > constricted blood vessels
  - > blood flow diminishes
- narrowing or occlusion of arteries outside the heart and brain by atherosclerotic plaque

Reference:

Peripheral Vascular Disease (PVD) // Memorial Hospital of South Bend // A South Bend, IN 526-bed regional referral center for cardiac, cancer, childbirth, emergency medicine and rehabilitation services. (no date). Available at : http://www.qualityoflife.org/memorialcms/index.cfm/heart/conditions/peripheral-vascular-disease/ (Accessed: 11 March 2015).

Stöppler, M. C. (no date) 'Peripheral Vascular Disease: Get the Facts on Symptoms'. MedicineNet. Available at: http://www.medicinenet.com/peripheral_vascular_disease/article.htm (Accessed: 10 March 2015).

DEFINITION

- Commonly used referring to peripheral artery disease (PAD)
- narrowing or occlusion of arteries outside the heart and brain by atherosclerotic plaque

Reference:
Stöppler, M. C. (no date) 'Peripheral Vascular Disease: Get the Facts on Symptoms'. MedicineNet. Available at: http://www.medicinenet.com/peripheral_vascular_disease/article.htm (Accessed: 10 March 2015).

WHAT IS THE PERIPHERAL VASCULAR SYSTEM?

- the veins and arteries in the arms, hands, legs and feet
- Peripheral arteries supply oxygenated blood to the body
- Peripheral veins brings deoxygenated blood from the capillaries in the extremities back to the heart.
    - > for Intravenous therapy, it is the most common access for a peripheral intravenous (IV) line

REFERENCE:
Peripheral vascular system' (2014) *Wikipedia*. Wikipedia. Available at: http://en.wikipedia.org/wiki/Peripheral_vascular_system (Accessed: 10 March 2015).

DIFFERENCE BETWEEN PVD AND PAD

Peripheral Vascular Disease (PVD)

- There are problems altering the blood flow through both the arteries and veins.

Peripheral Artery Disease (PAD)

- is a type of PVD
- have problems only with arterial blood flow

Reference:
Peripheral Vascular Disease (PVD) // Memorial Hospital of South Bend // A South Bend, IN 526-bed regional referral center for cardiac, cancer, childbirth, emergency medicine and rehabilitation services. (no d
Available at: http://www.qualityoflife.org/memorialcms/index.cfm/heart/conditions/peripheral-vas
(Accessed: 11 March 2015).

EPIDEMIOLOGY/STATISTICS

- It affects 15%-20% of persons older than 70 years of age
- It affects 10-15% of the general population
  - > approximately 50% are asymptomatic

Reference:
Peripheral Artery Disease: Pathophysiology, Diagnosis and Treatment (2007). Elsevier. Available at: http://www.revespcardiol.org/en/peripheral-artery-disease-pathophysiology-diagnosis/articulo/131141/ (Accessed: 31 March 2015).

Peripheral arterial disease - diagnosis and management in general practice (no date). The Royal Australian College of General Practitioners. Available at: http://www.racgp.org.au/afp/2013/june/peripheral-arterial-disease-diagnosis/ (Accessed: 10 March 2015).

RISK FACTORS

- Positive family history of premature heart attacks or strokes
- Older than 50 years
- Overweight or obesity
- Inactive (sedentary) lifestyle
- Smoking
- Diabetes
- High blood pressure
- High cholesterol or LDL (the "bad cholesterol"), plus high triglycerides and low HDL (the "good cholesterol")

Reference:

'Peripheral Vascular Disease Causes, Symptoms, Treatment - Peripheral Vascular Disease Causes' (no date). eMedicineHealth. Available at: http://www.emedicinehealth.com/peripheral_vascular_disease/page2_em.htm (Accessed: 1 April 2015).

CAUSES:

1. Peripheral Artery Disease
   - the most common causes
   - due to atherosclerosis
     > there is a fatty material builds up inside the arteries that mixes with calcium, scar tissues, and other substances and hardens slightly, forming plaques of arteriosclerosis.

Reference:

'Peripheral Vascular Disease Causes, Symptoms, Treatment - Peripheral Vascular Disease Causes' (no date). eMedicineHealth. Available at: http://www.emedicinehealth.com/peripheral_vascular_disease/page2_em.htm (Accessed: 1 April 2015).

CAUSES:

2. Blood clot (thrombus/emboli)

3. Diabetes
   - High Blood Sugar level damages blood vessels
     > more likely to become narrowed or weakened
   - High Blood Pressure and high fats in the blood accelerates atherosclerosis development

Reference:

'Peripheral Vascular Disease Causes, Symptoms, Treatment - Peripheral Vascular Disease Causes' (no date). eMedicineHealth. Available at: http://www.emedicinehealth.com/peripheral_vascular_disease/page2_em.htm (Accessed: 1 April 2015).

CAUSES:

4. Inflammation of the arteries
   - called arteritis
     > cause narrowing or weakening of the arteries
   - Vasculitis developed from several autoimmune conditions
5. Infection
   - causes inflammation and scarring which can block, narrow, or weaken blood vessels
     > Example, salmonellosis and syphilis are traditionally known to infect and damage blood vessels.

Reference:

'Peripheral Vascular Disease Causes, Symptoms, Treatment - Peripheral Vascular Disease Causes' (no date). eMedicineHealth. Available at: http://www.emedicinehealth.com/peripheral_vascular_disease/page2_em.htm (Accessed: 1 April 2015).

CAUSES:

6. Structural defects
   - Defects in the structure of a blood vessel can cause narrowing mostly acquired at birth
   - the cause remains unknown
      > Example:Takayasu disease is a vascular disease affecting the uppe vessels of the body and affects usually Asian females
7. Injury
   - such as a car wreck or a bad fall.

Reference:

'Peripheral Vascular Disease Causes, Symptoms, Treatment - Peripheral Vascular Disease Causes' (no date). eMedicineHealth. Available at: http://www.emedicinehealth.com/peripheral_vascular_disease/p[illegible].htm (Accessed: 1 April 2015).

PATHOPHYSIOLOGY:

6. Structural defects
   - Defects in the structure of a blood vessel can cause narrowing mostly acquired at birth
   - the cause remains unknown
      > Example:Takayasu disease is a vascular disease affecting the uppe vessels of the body and affects usually Asian females
7. Injury
   - such as a car wreck or a bad fall.

Reference:

'Peripheral Vascular Disease Causes, Symptoms, Treatment - Peripheral Vascular Disease Causes' (no date). eMedicineHealth. Available at: http://www.emedicinehealth.com/peripheral_vascular_disease/page2_em.htm (Accessed: 1 April 2015).

PATHOPHYSIOLOGY:

Presence of occlusive arterial disease

- the underlying disease process is arteriosclerotic disease
- causes inadequate blood flow to the limbs (Ischemia)
  > classified as:
    a. Functional
       when the blood flow is normal at rest but insufficient during exercise (clinically presented as Intermittent Claudication)
    b. Critical
       there is perfusion deficit at rest, presence of pain at rest, or trophic lesions in the legs, clear risk of loss of limb (if adequate blood flow is not re-established either by surgery or by endovascular therapy)

Reference:

Peripheral Artery Disease: Pathophysiology, Diagnosis and Treatment (2007). Elsevier. Available at: http://www.revespcardiol.org/en/peripheral-artery-disease-pathophysiology-diagnosis/articulo/13114315/ (Accessed: 31 March 2015).

PATHOPHYSIOLOGY:

There is arterial stenosis naturally progressing to cause complete arterial occlusion.

- abrupt insufficient blood supply to peripheral tissues (high risk plague) caused by acute ischemia of thrombotic origin

Reference:

Peripheral Artery Disease: Pathophysiology, Diagnosis and Treatment (2007). Elsevier. Available at: http://www.revespcardiol.org/en/peripheral-artery-disease-pathophysiology-diagnosis/articulo/13314[illegible] (Accessed: 31 March 2015).

SYMPTOMS:

*depend on:

- what artery is affected
- how severely the blood flow is reduced

1. Claudication (dull, cramping pain in hips, thighs or calf muscle)
2. Buttock pain
3. Numbness or tingling in leg, foot or toes
4. Changes in skin color (pale, bluish or reddish discoloration)
5. Changes in skin temperature, coolness
6. Impotence
7. Infection/sores that do not heal
8. Ulceration or gangrene
9. Uncontrolled hypertension (high blood pressure)
10. Renal failure

Reference:

Peripheral Vascular Disease (PVD) // Memorial Hospital of South Bend // A South Bend, IN 526-bed regional referral center for cardiac, cancer, childbirth, emergency medicine and rehabilitation services. (no date). Available at: http://www.qualityoflife.org/memorialcms/index.cfm/heart/conditions/ (Accessed: 11 March 2015).

4 Stages Classification of Leriche-Fontaine (Table 1):

TABLE 1. Fontaine's Clinical Classification

Grade I	Asymptomatic. Detectable by ankle-arm index <0.9
Grade IIa	Intermittent claudication not limiting the patient's life style
Grade IIb	Intermittent claudication limiting for the patient
Grade III	Pain or paresthesias at rest
Grade IV	Established gangrene. Trophic lesions
Grade III and/or IV	Critical ischemia. Threat of loss of limb

Reference:

Peripheral Artery Disease: Pathophysiology, Diagnosis and Treatment (2007). Elsevier. Available at: http://www.revespcardiol.org/en/peripheral-artery-disease-pathophysiology-diagnosis/articulo/13314[illegible] (Accessed: 31 March 2015).

TABLE 2. Symptoms According to the Area of Arterial Lesion

Area of Lesion	Clinical Picture
Aortoiliac	Buttock-thigh-calf claudication Impotency in a man (if bilateral involvement is present): Leriche syndrome
Femoropopliteal	Calf claudication with/without plantar claudication
Infrapopliteal	Plantar claudication

Reference:

Peripheral Artery Disease: Pathophysiology, Diagnosis and Treatment (2007). Elsevier. Available at: http://www.revespcardiol.org/en/peripheral-artery-disease-pathophysiology-diagnosis/articulo/13114132/ (Accessed: 31 March 2015).

DIAGNOSIS PROCEDURE:

Ankle Brachial Index (ABI)
Ultrasound Doppler Test
Angiogram

Reference:

Peripheral Vascular Disease (PVD) // Memorial Hospital of South Bend // A South Bend, IN 526-bed regional referral center for cardiac, cancer, childbirth, emergency medicine and rehabilitation services. (no date). Available at: http://www.qualityoflife.org/memorialcms/index.cfm/heart/conditions/peripheral-vascular-disease-pvd/ (Accessed: 11 March 2015).

TREATMENT:

Invasive Interventions

1. Angioplasty and Stents
2. Atherectomy
   - a minimally invasive intervention procedure
   - excision and removal of blockages by catheters with miniature cutting systems.

Purpose of the procedures:

removes plague
compresses plague or
displacing of plague

Reference:

Peripheral Vascular Disease (PVD) // Memorial Hospital of South Bend // A South Bend, IN 526-bed regional referral center for cardiac, cancer, childbirth, emergency medicine and rehabilitation services. (no date). Available at: http://www.qualityoflife.org/memorialcms/index.cfm/heart/conditions/peripheral-vascular-disease-pvd/ (Accessed: 11 March 2015).

During these procedures:

- the physician will periodically inject a contrast dye
- x-ray pictures are taken to determine whether or not the artery is sufficiently open

Reference:

Peripheral Vascular Disease (PVD) // Memorial Hospital of South Bend // A South Bend, IN 526-bed regional referral center for cardiac, cancer, childbirth, emergency medicine and rehabilitation services. (no date). Available at: http://www.qualityoflife.org/memorialcms/index.cfm/heart/conditions/peripheral-vascular-disease-pvd/ (Accessed: 11 March 2015).

TREATMENT:

Surgery

- If blockage is extremely long
- If blockage has become very hard and calcified with time
- If blockage may be resistant to atherectomy or angioplasty and stents

- **Purpose:**
  > to bypass the problem area.

Reference:

Peripheral Vascular Disease (PVD) // Memorial Hospital of South Bend // A South Bend, IN 526-bed regional referral center for cardiac, cancer, childbirth, emergency medicine and rehabilitation services. (no date). Available at: http://www.qualityoflife.org/memorialcms/index.cfm/heart/conditions/peripheral-vascular-disease-pvd/ (Accessed: 11 March 2015).

TREATMENT:

Surgical Intervention

Revascualrization

- to prevent limb loss
- for patients with rest pain, tissue loss, or gangrene (s/s of Critical Limb Ischemia)
- **includes:**
  - > endovascular angioplasty or stenting, or
  - > open surgical reconstruction by peripheral bypass or endarterectomy

Reference:

Peripheral arterial disease - diagnosis and management in general practice (no date). The Royal Australian College of General Practitioners. Available at: http://www.racgp.org.au/afp/2013/june/peripheral-arterial-disease-diagnosis/ (Accessed: 10 March 2015).

TREATMENT:

Non-invasive interventions

1. Exercise
2. Positioning
   - avoid crossing of legs (interferes blood flow)
   - elevate feet at rest (manages swelling)
     > not above the heart level
     > extreme elevation slows arterial blood flow to the feet

Reference:

Peripheral Vascular Disease (PVD) // Memorial Hospital of South Bend // A South Bend, IN 526-bed regional referral center for cardiac, cancer, childbirth, emergency medicine and rehabilitation services. (no date). Available at: http://www.qualityoflife.org/memorialcms/index.cfm/heart/conditions/peripheral-vascular-disease-pvd (Accessed: 11 March 2015).

TREATMENT:
Non-invasive interventions

3. Promoting Vasodilation (increasing the diameter of blood vessels)
   - provision of warmth to the affected extremity
     > maintain a warm environment at home
     > wear socks or insulated shoes at all times
     > Never apply direct heat to the limb (heating pad or extremely hot water) to reduce the risk of burns
4. Stop Smoking
   - Smoking causes vasoconstriction

Reference:

Peripheral Vascular Disease (PVD) // Memorial Hospital of South Bend // A South Bend, IN 526-bed regional referral center for cardiac, cancer, childbirth, emergency medicine and rehabilitation services. (no date). Available at: http://www.qualityoflife.org/memorialcms/index.cfm/heart/conditions/peripheral-vascular-disease-pvd/ (Accessed: 11 March 2015).

TREATMENT:
Non-invasive interventions

5. **Avoid exposure to cold temperatures**
6. **Avoid or limit intake of caffeine**
   - causes vasoconstriction.
7. **Medications**
   - given to patients with chronic PVD
     > Antiplatelet medications (such as Aspirin and Plavix)
8. **Rolling Hypertension**
   - Controlling high blood pressure can improve blood flow through the blood vessels and reduce the constriction

Reference:

Peripheral Vascular Disease (PVD) // Memorial Hospital of South Bend // A South Bend, IN 526-bed regional referral center for cardiac, cancer, childbirth, emergency medicine and rehabilitation services. (no date). Available at: http://www.qualityoflife.org/memorialcms/index.cfm/heart/conditions/peripheral-vascular-disease-pvd/ (Accessed: 11 March 2015).

MANAGEMENT:

Lifestyle modifications

Smoking cessation

- improvement of walking distance
- 5 year survival rate is doubled
- Post-operative complications is reduced

Reference:

Peripheral arterial disease – diagnosis and management in general practice (no date). The Royal Australian College of General Practitioners. Available at: http://www.racgp.org.au/afp/2013/june/peripheral-arterial-disease-diagnosis/ (Accessed: 10 March 2015).

MANAGEMENT:

Exercise and diet

Exercise

- Supervised exercise programs to improve walking time and walking distance
- walk until pain is felt, take a rest until the pain subsides (For 3x a week, repeat this cycle to a total of 30 minutes, and progress to 60 minutes per day)

Diet

- low salt
- low fat,
- moderate amounts of added sugar intake

Reference:

Peripheral arterial disease - diagnosis and management in general practice (no date). The Royal Australian College of General Practitioners. Available at: http://www.racgp.org.au/afp/2013/june/peripheral-arterial-disease-diagnosis/ (Accessed: 10 March 2015).

By: Rommel Luis C. Israel III

MANAGEMENT:

Pharmacotherapy

Antiplatelet agents

- Clopidogrel (75 mg/day)
  - > Is superior to aspirin (325 mg/day)
  - > for the reduction of the combined risk of ischaemic stroke, myocardial infarction, or vascular death.

Reference:

Peripheral arterial disease - diagnosis and management in general practice (no date). The Royal Australian College of General Practitioners. Available at: http://www.racgp.org.au/afp/2013/june/peripheral-arterial-disease-diagnosis/ (Accessed: 10 March 2015).

MANAGEMENT:

Pharmacotherapy

Lipid lowering agents

- **simvastatin** (40 mg/day)

> as an addition to existing treatments to reduce the rates of myocardial infarction, stroke and revascularisation

How?

> By decreasing risks of major vascular events rather than the concentration of blood lipid alone.

Reference:

Peripheral arterial disease - diagnosis and management in general practice (no date). The Royal Australian College of General Practitioners. Available at: http://www.racgp.org.au/afp/2013/june/peripheral-arterial-disease-summary/ (Accessed: 10 March 2015).

MANAGEMENT:

Pharmacotherapy

Cilostazol

- a phosphodiesterase III inhibitor (newly introduced in Australia)
- improves walking distance in people with Intermittent Claudication

Reference:

Peripheral arterial disease – diagnosis and management in general practice (no date). The Royal Australian College of General Practitioners. Available at: http://www.racgp.org.au/afp/2013/june/peripheral-arterial-disease-diagnosis/ (Accessed: 10 March 2015).

MANAGEMENT:

Pharmacotherapy

Ramipril (10 mg/day)

- angiotensin converting enzyme inhibitor (ACEI)
- increases pain-free walking distance, maximum walking time and Walking Improvement

Reference:

Peripheral arterial disease – diagnosis and management in general practice (no date). The Royal Australian College of General Practitioners. Available at: http://www.racgp.org.au/afp/2013/june/peripheral-arterial-disease-diagnosis/ (Accessed: 10 March 2015).

MANAGEMENT:

Pharmacotherapy

Calcium channel blockers

- are protective against all-cause, cardiovascular and cerebrovascular disease mortality
- Relaxes blood vessels

Reference:

Peripheral arterial disease – diagnosis and management in general practice (no date). The Royal Australian College of General Practitioners. Available at: http://www.racgp.org.au/afp/2013/june/peripheral-arterial-disease-diagnosis/ (Accessed: 10 March 2015).

MANAGEMENT:

Little evidence to support for the role of complementary therapies:

- vitamin E
- garlic
- ginkgo biloba

Reference:

Peripheral arterial disease - diagnosis and management in general practice (no date). The Royal Australian College of General Practitioners. Available at: http://www.racgp.org.au/afp/2013/june/peripheral-arterial-disease-diagnosis/ (Accessed: 10 March 2015).

LATEST NEWS:

Polypill Strategy

- could reduce heart problems by 88%
- would be likely to reduce problems caused by hardening of the arteries in the legs
- The ingredients (drugs in common use today):
  - > a statin (to lower cholesterol)
  - > a thiazide diuretic, a beta blocker and an angiotensin converting enzyme (ACE) inhibitor (to lower blood pressure)
  - > folic acid (to reduce homocysteine)
  - > aspirin (to reduce blood clotting)

Note: This combination is only a suggestion at present (although, these drugs already have a proven track record). It would need to be thoroughly tested.

Reference:

Hardening of the arteries, effects, treatment and prevention. Vascular risk factors (no date). Available at: http://www.vascular.co.nz/hardening_of_the_arteries.htm#Primary (Accessed: 12 March 2015).