

# Peripheral Arterial Disease

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## Summary

Peripheral arterial disease (PAD) is a common disease. One in five of the middle-aged population of the United Kingdom has evidence of peripheral vascular disease on clinical examination, although only a quarter of these people have symptoms<sup>1</sup>. PAD is a distinct atherothrombotic syndrome that is associated with an elevated risk of cardiovascular and cerebrovascular events, including death, myocardial infarction (MI) and stroke<sup>2</sup>. In essence, PAD is an important manifestation of systemic atherosclerosis. **(SA Fam Pract 2004;46(8): 9-12)**

### PAD epidemiology, prevalence and risk factors

Peripheral arterial disease is a progressive disease which includes stenosis and occlusions in the peripheral arterial bed. The commonest manifestation of PAD is in the lower limbs and it can be symptomatic or asymptomatic. In the legs, the symptoms range from intermittent claudication to critical limb ischaemia (rest pain, ulceration and/or gangrene). Most cases of PAD are, however, asymptomatic.

Prevalence varies in most countries, but current epidemiologic studies predict that 27 million people in the USA and Europe have PAD (16% of the population 55 years and over). An estimated 10.5 million are symptomatic and the majority (16.5 million) are asymptomatic (3).

Peripheral arterial disease is a powerful indicator of systemic atherothrombotic disease. The true incidence and prevalence of PAD in SA is unknown. However, local studies<sup>4,5</sup> have revealed that in all three population groups, viz. whites, Asians and blacks, atherosclerosis was the main cause of chronic PAD. In approximately 12 000 patients screened, atherosclerosis was the underlying aetiology in 98% of whites, 91% of Asians, and 85% of blacks. In the black population 86% of the patients presented with critical ischaemia and only 14% with claudication. These local studies revealed that PAD is well established, even in the black population.

### Risk factors for PAD

PAD risk factors are almost identical to those of developing atherosclerosis disease elsewhere. The most important risk factors are smoking, the male gender and diabetes<sup>2</sup>.

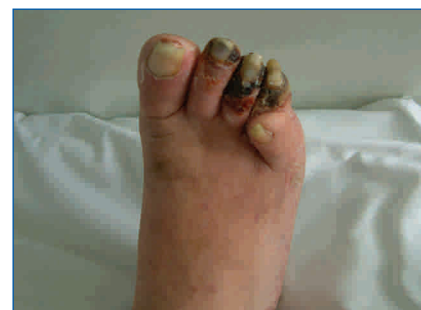
1. Age and sex: Males are more likely to be affected than females, as are elderly patients over 55 years.
2. Smoking: 2 to 3 times more at risk
3. Diabetes: Prevalence of PAD is 20% to 50%.
4. Hypertension: (Risk for PAD in hypertensive males: 2.5 fold.) (Risk for PAD in hypertensive females: 3.9 fold.)
5. Hyperlipidaemia
6. Hyperhomocysteinaemia
7. Obesity
8. Physical inactivity

### Symptoms of PAD

Most patients with PAD will be asymptomatic. However, those presenting with symptoms may present with intermittent claudication, critical ischaemia or gangrene (late onset) in relation to the limbs. Depending on the site of the arterial tree affected, the patient may also present with mesenteric angina (abdominal pain after meals), transient ischaemic attacks or stroke, renal failure (renal artery disease) or myocardial infarction. The most common manifestation of arterial disease is in the lower limbs, where, patients present with intermittent claudication(IC).

IC manifests as muscle pain in the lower limbs on exercise. The muscle groups affected will depend on the level of arterial tree occluded. Aorto-iliac occlusive disease patients will have thigh or buttock pain and femoro-popliteal occlusion will present with calf muscle group pain. More importantly, atherosclerosis may cause or worsen multi-level disease in segments of the arterial tree that are already diseased, so that the same patient may have both aorto-iliac and femoro-popliteal disease. The pain rapidly improves on cessation of exercise/walking.

Those patients with severe occlusive disease will present with rest pain, ischaemic ulcer or gangrene (figure1).



**Figure 1:** Patient with digital gangrene and rest pain (critical limb ischaemia)

### Diagnosis of PAD

PAD is frequently underdiagnosed because of patients not reporting symptoms affecting their legs or simply because their lifestyles are too sedentary for symptoms to manifest. Symptoms of IC may also simply not be felt. Also, primary care doctors often do not associate PAD with other chronic concurrent problems and therefore may miss the diagnosis.

The first step in making a diagnosis is to identify patients at risk for PAD. An accurate history will differentiate intermittent claudication from other causes of pain such as neuropathy, spinal claudication and knee or hip osteoarthritis. Then, careful physical examination of the pulses will identify patients with PAD. Clinical examination may reveal absent pulses, pallor on elevation of the feet and loss of hair on the limb. Auscultation of the pulses may reveal a bruit, which implies turbulent flow. Diabetic patients may also have evidence of motor, sensory and/or autonomic neuropathy.

**Laboratory Tests**

The following blood tests should be done:

- FBC
- Platelet count.
- Fasting blood glucose and HBA1c in known diabetics on treatment.
- Urea, creatinine & electrolytes.
- Fasting lipid profile.
- Urine analysis for glucose and proteins.

In younger patients (< 50 years): Screen for hypercoagulable state and hyperhomocysteinaemia.

**Other manifestation of peripheral arterial disease:**

- Acute and chronic limb ischaemia.
- Aneurysmal disease.
- Carotid artery disease.
- Visceral ischaemic disease
  - Mesenteric ischaemia
  - Renal artery stenosis

(These topics will be individually dealt with in the follow-up articles.)

Although modification of risk factors has not been shown to prevent progression of peripheral vascular disease or the loss of a limb, it has been

shown to reduce the risk of fatal and non-fatal myocardial infarction and stroke. Therefore it is most important that risk factor modification be established as a primary tool in the treatment of patients with PAD to minimize cardiovascular events.

**PAD Management:**

Clinicians must treat PAD-specific symptoms in order to decrease functional impairment, improve quality of life, decrease amputations and underlying systemic atherothrombosis (to reduce subsequent cardiovascular ischaemic

**Figure 2: Measuring the Ankle Brachial Index (ABI)**

The ABI is a simple non-invasive test to assess the patency of the extremity arterial system. It is an efficient and objective means of documenting the presence of severe lower extremity artery disease.



**ABI =**

Highest ankle arterial pressure

Highest brachial arterial pressure

**Method**

1. The patient lies supine.
2. The peripheral pulses are examined.
3. The blood pressure cuff is placed around the upper-arm or calf.
4. An audible pulse is established with the Doppler (5-7 MHz).
5. The cuff of the blood pressure apparatus is then inflated until the pulse is not audible.
6. The cuff is then slowly deflated until the pulse is audible.
7. The blood pressure reading at the onset of the audible pulse is recorded at the brachial and the dorsalis pedis and/or posterior tibial arterial pulses as their respective arterial pressures.
8. The systolic blood pressure can also be measured in each arm.
9. The ankle brachial index (ABI) is calculated by dividing the higher of the ankle systolic pressure by the higher of the two brachial pressures

**Interpretation:**

- **Normal:** ABI of 1.0 or greater.
- **PAD:** ABI < 0.9
- **Severe PAD:** ABI < 0.4
- A diagnosis of PAD is based on the presence of limb symptoms or an ABI < 0.9.
- An ABI < 0.9 is also highly predictive of morbidity and mortality from cardiovascular events such as stroke and MI.
- The lower the ABI the higher the risk of cardiovascular events.

events, especially MI and stroke). There is no doubt that PAD is indicative of more generalized atherosclerosis and therefore, by modifying known risk factors one can minimize future cardiovascular events.

### 1. Smoking Cessation

Cigarette smoking is implicated in one third of all deaths from coronary artery disease. It is therefore of paramount importance to educate, encourage and assist PAD patients in quitting smoking. An average of only 4% succeed, therefore active treatment strategies need to be set up, which should include smoking cessation programmes and nicotine replacement therapy. Recently, the antidepressant drug bupropion, in conjunction with counselling programmes, has had encouraging results. Firm evidence also exists that smoking cessation may increase walking distance by 3 fold in 85% of patients with intermittent claudication.

Measure to stop smoking<sup>6</sup> :

- Public health education
- Support groups and counselling
- Increase taxes on cigarettes
- Nicotine replacement therapy
- Smoke-free hospitals and workplaces.
- Advice from doctors
- Bupropion with counselling
- Nurse case managers

### 2. Hyperlipidaemia

There is a clear association between total cholesterol concentration and cardiovascular death. Dietary measures can reduce serum cholesterol and low density lipoprotein (LDL) by about 10%, but there is usually poor compliance. The use of statins (hydroxymethylglutaryl coenzyme A reductase (HMGCo-AR) inhibitors) which reduce total cholesterol and LDL by 25%, reduce the risk of cardiovascular morbidity and mortality in PAD patients by up to 25% irrespective of age, sex, or baseline cholesterol concentration. The consensus opinion supports the use of statins in patients with PAD who have a total serum cholesterol > 5.5mmol/L.

Dietary modification in hyperlipidaemia<sup>6</sup>:

- Reduce total fat (<30% of total energy).
- Reduce saturated fat intake (< 7% of energy).
- Decrease dietary cholesterol intake (<200mg/day).

- Increase fibre intake.
- Aim for ideal body mass index (21 – 25 kg/m<sup>2</sup>).

### 3. Diabetes Mellitus

The diagnosis of type 2 diabetes, or its exclusion, is important in patients with PAD. Poor glycaemic control in diabetes is associated with an increased risk of microvascular complications. Tight glycaemic control also has beneficial effects on serum lipid concentration. Careful attention to foot care is of paramount importance in diabetics.

Diabetics may present with aggressive atherosclerosis affecting all the arterial beds.

### 4. Hypertension

The benefit of treating hypertension are well known and well proven. Data indicate that BP targets of less than 140/90mmHg for non-diabetic patients and 130/80 mmHg for patients with Type 2 diabetes are advisable.

In the short term a reduction in BP may worsen intermittent claudication. The HOPE study<sup>7</sup> has shown that ramipril (an ACE-inhibitor) reduces cardiovascular morbidity and mortality in patients with PAD by approximately 25%. The implication from this study is that most patients with PAD would benefit from an ACE-inhibitor.

### 5. Exercise

Exercise is the mainstay of therapy for PAD. In over 20 randomized studies, exercise improved not only the maximal walking distance, but also quality of life and cardiovascular risks<sup>2</sup>. Supervised exercise programmes are recommended. However, if such programmes don't exist, patients with intermittent claudication should be advised to walk for at least an hour a day, pausing to rest when claudication pain occurs. This kind of "exercise therapy" not only improves walking distance, but has an added effect on the cardiovascular physiology.

### 6. Antiplatelet therapy

In patients with cardiovascular disease, antiplatelet drugs reduce the risk of non-fatal myocardial infarction, ischaemic stroke and death from vascular causes. These conclusions are based on a meta-analysis conducted by the Antiplatelet Trialist Collaboration<sup>8</sup>.

Aspirin has proved effective in secondary prevention of cardiovascular events. Patients with PAD who do not

have contra-indication to aspirin therapy should be given 75mg of aspirin daily.

Other antiplatelet drugs such as clopidogrel (a thienopyridine that has few haematological side-effects) has recently been proven to be effective in preventing fatal and non-fatal myocardial infarction and ischaemic stroke, as well as death. These results were from the Caprie trial<sup>9</sup> and the most significant effect was seen in patients with PAD. The FDA has given approval for clopidogrel to be used for the secondary prevention of atherosclerotic events in patients with PAD and systemic atherosclerosis.

### In summary

PAD is a common but under-diagnosed problem affecting the elderly population. Intermittent claudication is the most common symptoms of PAD. PAD is a marker for generalised atherosclerosis and is closely associated with coronary and cerebrovascular morbidity and mortality. Early recognition by examination of pulses and diagnosis of PAD with an ABI, combined with a multi-disciplinary approach to the medical management of PAD ( i.e. modify risk factors) will reduce the overall cardiovascular risk.✍

### See CPD Questionnaire p.43

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