

Peripheral arterial disease and the diabetic foot

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Article points

1. Peripheral arterial disease is often asymptomatic and many patients are often undiagnosed.
2. Undiagnosed patients are at risk of intermittent claudication, cerebrovascular and cardiovascular events.
3. Early screening, reducing modifiable risk factors and proper treatment significantly reduces morbidity and mortality.

Key words

- peripheral arterial disease
- risk stratification
- screening

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Peripheral arterial disease (PAD) is a term used to describe atherosclerotic vessels in the periphery, mostly affecting the lower extremities. The blocked vessels impair blood and oxygen perfusion to the lower limbs and may lead to increased risk of ulceration, wounds and amputations. PAD is also associated with increased risk of coronary and cerebrovascular incidents. More than 50% of people living with PAD may not have any clinical symptoms, posing a challenge to diagnosis and management. This article will discuss the aetiology, presentation, risk factors, and management of PAD as related to the lower extremities.

In peripheral arterial disease (PAD), atherosclerotic vessels in the periphery impair blood and oxygen perfusion to the lower limbs and may lead to increased risk of ulceration, wounds and amputations. PAD is also associated with increased risk of coronary and cerebrovascular incidents (Meru et al, 2006).

The main risk factors for PAD include smoking, diabetes, high cholesterol and family history (Meru et al, 2006). More than 50% of people living with PAD may not show any clinical symptoms, hence proper diagnosis and management is challenging (Hirsch et al, 2007; Norgren et al, 2007). This article will discuss the aetiology, presentation, risk factors, and management of PAD as related to the lower extremities.

Aetiology and presentation

PAD is a macrovascular complication of diabetes mainly caused by atherosclerosis, whereby fatty plaque deposits progressively narrow the lumen of the arteries and decrease vascular perfusion to the lower limbs.

Symptoms may be silent or range from mild to severe, depending on the progression of the disease. The most common symptoms of PAD are intermittent claudication, described as pain, cramping and discomfort intensified

by movement and relieved by rest (McDermott et al, 2001; Norgren et al, 2007). Intermittent claudication rarely occurs in the feet, but more often is experienced in the calf, thigh or buttocks (Abramson et al, 2005). As the disease advances, symptoms of intermittent claudication may progress to critical limb ischemia and present as ulcers, pain at rest and gangrene (Varu et al, 2010). Other signs of PAD include shiny skin, absence of hair, and distal pallor (McDermott et al, 2001).

Risk factors

PAD risk factors are similar to those for other atherosclerotic diseases such as coronary artery disease. Modifiable risk factors include smoking, diabetes, hypertension, hypercholesterolaemia and sedentary lifestyle.

Tobacco users are four times more likely to develop PAD than non-users. Smoking causes damage to the vascular endothelium, promotes coagulation, and accelerates the progression of atherosclerosis (Hirsch et al, 1997).

Non-modifiable risk factors include age and heredity. The risks of PAD increase in patients who are greater than 70 years old, in those who are 50 to 69 years old with a history of diabetes or smoking, and in patients who are 40 to 49 years old with diabetes and one or more atherosclerosis-related risk

factors, intermittent claudication, abnormalities in pulse palpation of the lower limb or atherosclerosis in non-peripheral arteries, such as carotid, renal and coronary arteries (Layden et al, 2012). Several studies have shown that smoking and diabetes are the factors most correlated with the development of intermittent claudication in PAD (Abramson et al, 2005).

People with diabetes have a twofold increased risk of developing intermittent claudication. Studies demonstrate that smoking has a stronger correlation in predicting PAD than it does with coronary artery disease (Kannel and McGee, 1985). People with symptomatic PAD have a six times greater risk of death from cardiovascular disease, including myocardial infarction and stroke (Hirsch et al, 1997; *Box 1*).

Screening and diagnosis

Although PAD contributes to significant mortality and morbidity, it remains asymptomatic in a large number of patients and is frequently underdiagnosed and undertreated (Abramson et al, 2005).

The Canadian Cardiovascular Consensus Society recommends screening patients with recognised cardiovascular risk factors, men over the age of 40, or women who are postmenopausal or over the age of 50 (Anderson et al, 2016).

Screening and diagnosis recommendations:

- Detailed history via Edinburgh Claudication Questionnaire.
- Physical examination (femoral bruits and pedal pulses).
- Use resting ankle brachial pressure index (ABPI) to establish lower extremity PAD diagnosis in those with suspected PAD, defined as individuals with one or more of the following: exertional leg symptoms, non-healing wounds, age ≥ 65 years, or age ≥ 50 years with a history of smoking or diabetes.
- Use ABPI to confirm a new diagnosis and establish a baseline in all new patients with PAD, regardless of severity.
- Use toe-brachial index to establish a diagnosis of PAD in those with non-compressible vessels.
- Segmental pressure measurements are useful too when anatomic localisation of PAD is required to create a therapeutic plan.

Diagnostic testing includes:

- ABPI < 0.9 confirms diagnosis of PAD; ABPI < 0.4 establishes severe disease (*Figure 1*).
- Segmental limb pressures.
- Pulse volume recordings.
- Doppler velocity waveform analysis.
- Functional testing.
- Treadmill exercise testing.
- Duplex scanning.
- Advanced imaging techniques.

Risk factor management

People with PAD, as with other atherosclerotic diseases such as coronary artery disease and cerebrovascular disease, are best managed by managing modifiable risk factors by non-pharmacologic and pharmacologic measures. Treatment goals include improving functional mobility and quality of life, promoting limb survival and reducing likelihood of cardiovascular events.

The benefits of supervised exercise are seen as early as 4 weeks and up to 1 year after initiating exercise therapy. It is important to emphasise supervised exercise, because studies have shown lack of efficacy of non-supervised exercise (Fokkenrood et al, 2013).

Tobacco use has a strong association with PAD,

“People with diabetes have a twofold increased risk of developing intermittent claudication.”

Box 1. Risk factors for PAD.

- Age:
 - People > 70 years.
 - Males > 50 years with a risk factor of diabetes or smoking.
 - Females > 60 years with a risk factor of diabetes or smoking.
 - Age > 40 years with associated risk factor of diabetes, smoking, hypertension or hypercholesterolaemia.
- Diabetes.
- Dyslipidaemia.
- Tobacco use.
- Family history.
- Sedentary lifestyle/obesity.
- Atherosclerotic disease:
 - Cerebrovascular.
 - Coronary.
 - Renal.

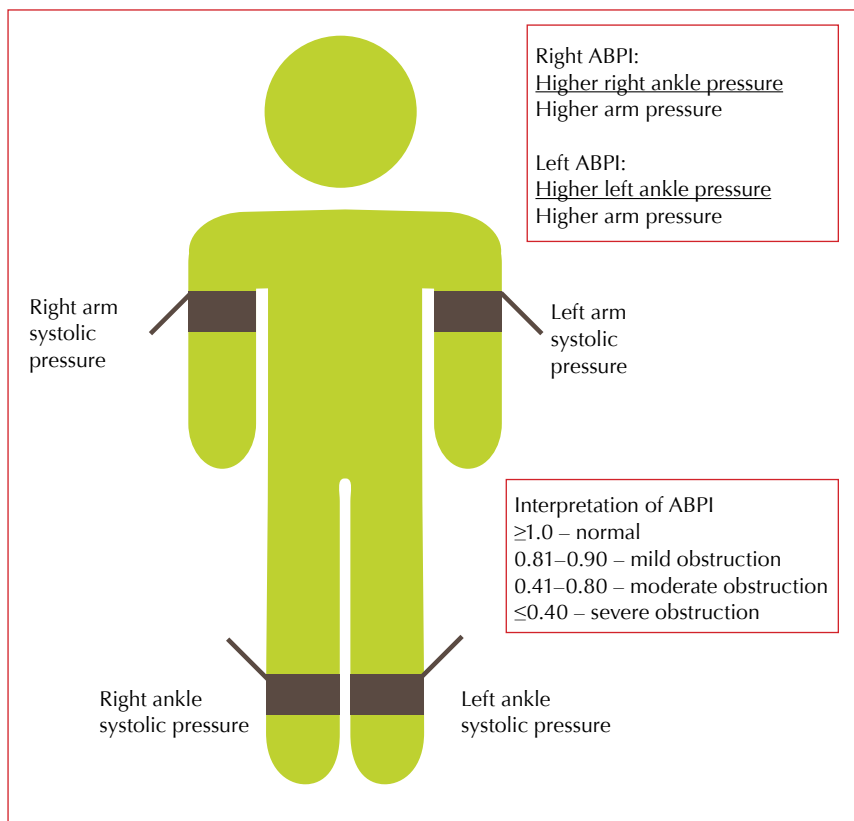


Figure 1. Performing an ABPI

Box 2. Risk factor management of PAD.

- Smoking cessation.
- Weight loss.
- Exercise.
- LDL <2mmol/L.
- HbA_{1c} <6%.
- BP <130/80 mmHg in people with diabetes; BP <140/90 mmHg in others.
- Platelet inhibition.

and smokers are four times more likely to develop PAD (Abramson et al, 2005). Box 2 lists risk factor management of PAD (Hiatt, 2001; McPherson et al, 2006).

Medical management

Pharmacological management of PAD aims to reduce vascular and claudication type events, including myocardial infarction, stroke, claudication and mortality. Management includes statins, ACE inhibitors, improved blood glucose control, blood pressure lowering, antiplatelet medications, and claudication targeted therapy (Abramson et al, 2005).

Interventional and surgical treatment

Interventional and surgical treatment is indicated for patients with advanced PAD who present with intermittent claudication or severe claudication symptoms.

The goal is to reduce severe pain, prevent limb loss, improve quality of life and promote survival. These interventions may be minimally invasive

(angioplasty or stenting), or invasive in the case of lower extremity bypass surgery (Vartanian and Conte, 2015).

Conclusion

PAD is a marker for cerebrovascular and cardiovascular events as well as ulcerations and amputations. Often asymptomatic, PAD is widely underdiagnosed and undertreated. Screening tools such as the Edinburgh Questionnaire and ABPI, along with aggressive risk factor management, are essential in reducing morbidity and mortality. ■

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