

A quick guide to vascular health



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About this Booklet

Welcome to 'My Vascular Health: A Quick Guide', your resource to help you learn about the vascular system, vascular diseases – including coronary artery disease (CAD) and peripheral artery disease (PAD) – and other important information including risk factors, how to reduce your risk, symptoms, diagnosis and treatment.

This booklet may act as a useful guide if you:

- > Have been diagnosed with vascular disease (specifically CAD or PAD)
- > Think you may be at risk of vascular disease
- > Want to help a loved one who has been diagnosed with vascular disease
- > Want to know more about vascular diseases and how to protect your vascular health



What is the Vascular System?

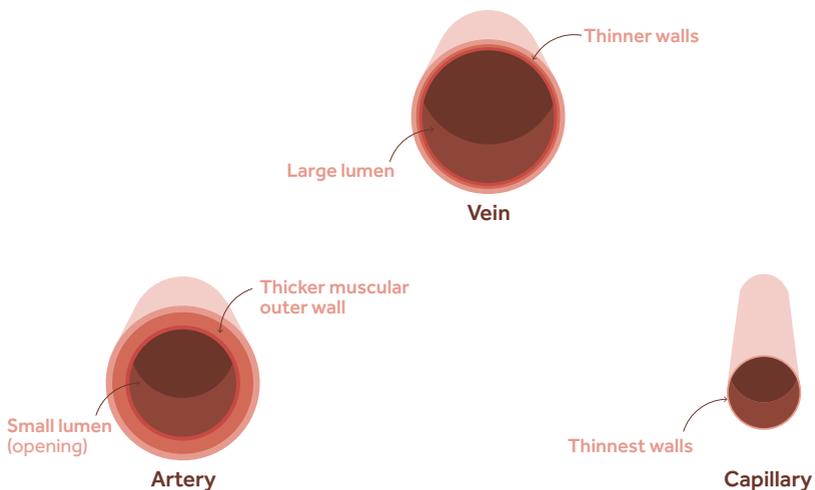
The vascular system is the body's network of vessels, responsible for carrying blood, oxygen and lymphatic fluid – fluid that contains blood cells – around the body. It is made up of three types of vessels: arteries, capillaries and veins¹.

Arteries are the largest of the vessels and carry oxygenated blood – blood that is rich in oxygen from the lungs – away from the heart to the organs and tissues. The blood carried by the arteries will come across high levels of blood pressure in its journey round the body, so the walls of the arteries are thicker and more muscular than other vessels in the vascular system².

Capillaries are the smallest of the vessels, making up 80% of the vascular system. They carry oxygenated blood through the organs and tissues, exchanging nutrients, gases and waste products².

Veins work differently to arteries and capillaries, and return the blood that has been transported by the arteries and capillaries around the body back to the heart².

Three main types of blood vessels²



What is Vascular Disease?

Vascular disease is a condition that affects the arteries and veins, and reduces blood flow through the body. This can result in damage to the organs or other body parts, such as the heart or even arms and legs¹.

Most vascular diseases are caused by a build-up of plaque in the arteries, a condition known as atherosclerosis³. This plaque is a fatty-substance that contains fat, cholesterol and calcium, and causes the arteries to narrow and harden, which limits the supply of blood, and subsequently oxygen, to parts of the body, leading to serious events such as heart attack and stroke⁴.

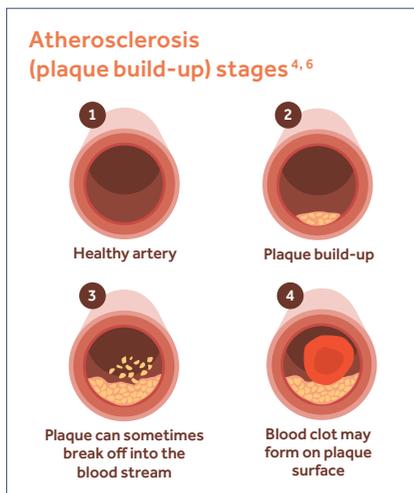
This plaque build-up can affect vessels in the entire body and worsens over time^{4,5}. As plaque builds up in the arteries, it can rupture and form a blood clot, which can grow and completely block blood flow to parts of the body⁶.

Atherosclerosis doesn't tend to have any symptoms at first. In fact, many people may be unaware they have it until a complete blockage occurs, which can result in serious events such as stroke (if blood flow is blocked to the brain), sudden lack of blood flow to the limbs (acute limb ischaemia), heart attack or even death³.

Vascular disease can take many forms, including coronary artery disease (CAD), where plaque builds up in the arteries supplying blood to the heart, and peripheral artery disease (PAD), where plaque builds up in the arteries supplying blood to the limbs.

It is important to understand that if you have been diagnosed with one vascular disease, you are likely to be at higher risk of having another. This is known as polyvascular disease and can include CAD, PAD and cerebrovascular disease (blockage of blood flow to the brain).

Polyvascular disease occurs because plaque build-up isn't limited to a single place but can build up in all major arteries across the body that supply your heart, limbs and brain. As a result, those with polyvascular disease are at risk of overlapping complications or events.



Vascular Diseases: CAD and PAD

What is CAD?

CAD is a form of vascular disease that is caused by a build-up of plaque in the coronary arteries, which supply blood to the heart⁷.

CAD, like other vascular diseases, often has no symptoms however underlying risks for unstable angina (irregular chest pain), and heart attack may be present. As plaque build-up in the arteries worsens, symptoms begin to develop and the build-up may result in chronic CAD with stable angina. If the plaque build-up is severe, it may result in unstable angina or heart attack.

Chronic CAD with stable angina^{8,9}

Stable angina causes uncomfortable pressure, fullness or squeezing pain in the centre of the chest which may also be felt in the neck, shoulders, back and arm. It occurs when the heart muscle needs more blood than it is getting, e.g. during physical activity or times of stress. The chest discomfort is usually predictable and manageable.

Angina in women can be different than in men. Angina symptoms in women can also include feeling out of breath, nausea, vomiting, abdominal pain or sharp chest pain.

If you experience this type of chest discomfort, or know you have stable angina and are getting chest pain more often or more easily, be sure to visit your doctor as you may be experiencing early signs of unstable angina.

Unstable angina^{9,10}

Unstable angina is caused by reduced blood flow to the heart muscle due to arteries being narrowed by atherosclerosis (plaque build-up) or blood clots. It results in irregular chest pain which may occur while you are resting or sleeping, and possibly get worse over time. If this plaque build-up worsens and completely blocks blood flow to the heart, it may result in a heart attack and could be fatal. If you have polyvascular disease, CAD can also be associated with an increased risk of stroke, should plaque build-up block blood flow to the brain⁷. Therefore, if you experience this type of new, worsening or persistent chest pain, you must see a doctor as soon as possible.

Your remaining risk

If you have unstable angina or a heart attack, it is important to understand that although you may not be experiencing any further symptoms, the risk of further complications may still remain even after preventative treatment as plaque build-up can still occur. That is why it is necessary to monitor your vascular health and take steps to control plaque build-up.

What is PAD?

PAD is another form of vascular disease also caused by plaque build-up. It is a common circulatory problem in which a build-up of plaque in the peripheral arteries, which supply oxygenated blood to the limbs, causes them to harden and narrow, limiting blood flow¹¹.

Half of people with PAD do not experience any symptoms¹². However, symptoms can include numbness or weakness in the legs, leg pain or cramping (known as claudication), sores on feet or legs that will not heal, changing skin colour and shiny skin on legs¹¹. Doctors classify the symptoms of PAD using the "Fontaine Classification", a spectrum that rates the severity of a patient's symptoms¹³. The method is categorised into four key stages:

- 1 Subtle symptoms such as an abnormal pulse, or no symptoms at all
- 2 Irregular cramping in the affected limb
- 3 Pain during rest periods, specifically at night
- 4 Sores and gangrene (tissue death)

Half of people with PAD do not experience any symptoms.

If you have PAD, you are at increased risk of having CAD.

Leg pain is the most common symptom of PAD¹². Around 1-3% of PAD patients who experience pain or cramping in the lower leg will need an amputation and this increases to 5% in patients who also have diabetes¹⁴.

If you have PAD, you are at increased risk of having CAD. This is because the plaque build-up isn't limited to your limbs, but can also build up in the major arteries that supply blood to your heart and brain. Therefore, those with PAD are also at risk of experiencing overlapping complications or events including stroke and heart attack¹⁴.

Your remaining risk

It is important to understand that your risk of further complications may still remain even after preventative treatment as plaque build-up can still occur. That is why it is necessary to monitor your vascular health and take steps to control plaque build-up and keep your quality of life as good as it can be.

Risk Factors for CAD and PAD

In order to understand the risk factors for CAD and PAD, it is important to know the risk factors for plaque build-up, the condition that leads to these vascular diseases.

Those most at risk of plaque build-up include^{3,10}:



People with a family history of the condition



Those aged 65+



Males



Those diagnosed with high cholesterol



Those diagnosed with high blood pressure



Those diagnosed with diabetes



Those with history of stroke

In addition, lifestyle factors that can put people at a higher risk of plaque build-up include^{3,10}:



Lack of exercise



Smoking



Being overweight or obese



Unhealthy diet



Stress

What can you do to reduce your risk?

Although some people inherit a higher risk of vascular disease, making it difficult to prevent, there are still ways to reduce your risk³:

- > Use one of the many resources available to help you quit smoking (i.e. books and recordings, nicotine replacements such as patch and gum, among others)
- > Have a healthy diet and weight by including vitamins, fibre and minerals into your daily meals¹⁵
- > Have a regular exercise regimen of at least 40 minutes, 3-4 times per week¹⁵
- > Get enough sleep – the amount of sleep a person needs varies, but 8 hours is the standard recommendation¹⁶
- > Spend a minimum of 15 minutes per day doing an activity that you enjoy to avoid excess stress¹⁷
- > Stay within the advised range of alcohol units (no more than 14 units per week)⁵

What to do if you think you may be at risk

Lifestyle changes can play an extremely important role in reducing your risk of vascular diseases and protecting your vascular health³. However, if you think you may be at risk, or already suffer from a vascular disease, medical help may be necessary and treatments may be prescribed to ensure you remain as healthy as possible.

It is generally advised that you visit your doctor for a vascular health check-up if you fall into any of the risk categories listed previously (i.e. high cholesterol and blood pressure, diabetes, older age) or have any symptoms related to vascular disease (i.e. chest pain, shortness of breath)³. It is also advised to have more regular check-ups as you reach middle age.

If you are over the age of 40, and feel you may be at increased risk of CAD and PAD, or already have these conditions, ask your doctor if you are doing all you can to protect your vascular health. You can find some helpful questions on the following page!

If you are over the age of 40, and feel you may be at increased risk of CAD and PAD, or already have these conditions, ask your doctor if you are doing all you can to protect your vascular health.

Questions

Some questions you may like to ask your doctor

Am I at risk of developing a vascular disease?

My family has a history of heart disease, which makes me genetically inclined to develop a similar condition. Am I likely to still develop such a condition?

Is breathlessness and chest pain in middle-age likely to be a sign of ageing, or something more serious?

What resources and support are available to help me stop smoking?



What can I do to reduce my risk of vascular disease?

Could you give me advice as to how to lose weight?

Is there anything I can do to reduce my blood pressure to help prevent vascular disease?

How can I reduce my cholesterol to help prevent vascular disease?

Diagnosis and Treatment

Diagnosis

There are a variety of ways in which CAD and PAD can be diagnosed.

Your doctor will usually collect information on your medical history and conduct a blood test. However, depending on the severity of your symptoms, your doctor may also carry out one of the following tests¹⁸:

CAD

CAD can be diagnosed in a variety of ways, including¹⁸:

Electrocardiogram: records electronic signals travelling through the heart to show blood flow deficiency, a sign of CAD.

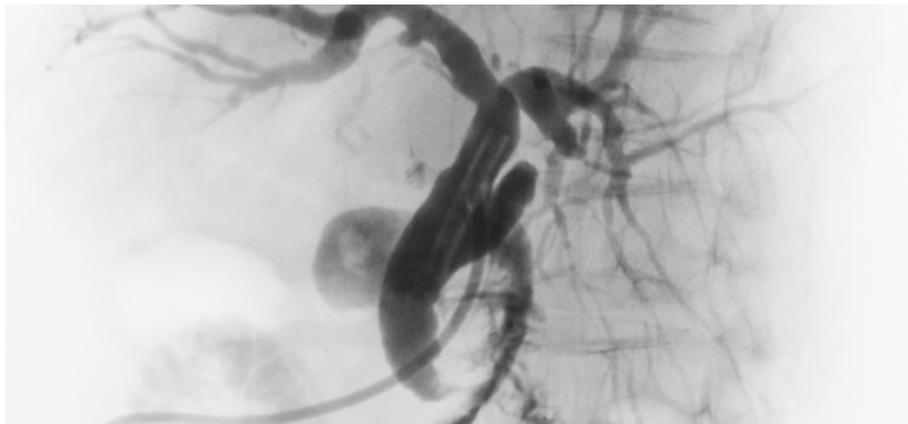
Echocardiogram: creates images of the heart via soundwaves to determine how well it's working. An area of the heart that shows weak movement can signal damage caused by a lack of oxygen and reduced blood flow.

Stress test: measures the impact of physical activity on the heart by conducting an electrocardiogram whilst walking on a treadmill, or doing a similar exercise.

A nuclear stress test: is similar to a stress test, but also collects images of the heart via a small camera inserted into the bloodstream. These images show resting and stress induced blood flow, which can highlight areas of the heart that receive less blood. This can be a sign of plaque build-up and, subsequently, CAD.

Angiogram: injects dye into the arteries to highlight any abnormalities, such as plaque build-up.

Heart scan: tests the level of calcium deposits, a component of plaque, to determine how narrowed the arteries are.





PAD

Some different ways in which PAD can be diagnosed include¹⁹:

Ankle-brachial index: a non-invasive exam that compares blood pressure in the leg and the arm to test for PAD. This is done via a blood pressure cuff and an ultrasound to examine both blood flow and pressure.

Physical exam: tests abnormalities in the pulse of a specific limb during exercise.

Angiogram: injects dye into the arteries to highlight any abnormalities, such as plaque build-up.

Blood test: Uses a blood sample to test for high cholesterol, a common risk factor of PAD and a sign of plaque build-up.

Diagnosis and Treatment

Treatment

Science and medicine in vascular health are moving at a fast pace in an area called vascular protection. Scientists are exploring how hazards can be further lowered for people at risk, and the results of these studies hold interest for both patients and doctors.

CAD

Treatment for chronic CAD with stable angina

Currently, the standard treatment for CAD with stable angina includes lifestyle changes, prescription medication and sometimes surgery. The standard medications prescribed to patients include cholesterol modifying medications (statins), high blood pressure control medications (anti-hypertensives), diabetes control medications (insulin/anti-glycaemic drugs) and blood clot prevention therapies (antiplatelets)^{18, 20}

Treatment for unstable angina

Similar to chronic CAD with stable angina, standard treatment for unstable angina also includes lifestyle changes and prescription medication as listed above. However, treatment may also require surgery, such as cardiac catheterisation, angioplasty and a bypass surgery. Blood thinners (anticoagulants) can also be prescribed for cardiac catheterisation.

If you have unstable angina, your doctor will need to find the blocked part of your artery through a process called cardiac catheterisation. During this procedure a catheter is guided through an artery in the arm or leg until it reaches the coronary arteries. A dye is sent through the catheter and X-rays are used to find the blockage so it can be treated⁹.

When the blockage has been identified, the two most common surgeries include angioplasty and coronary artery bypass surgery¹⁹. During an angioplasty, also known as a percutaneous coronary intervention (PCI)²⁰, a surgeon inserts a tube into the clogged part of the artery and inflates a balloon to compress the plaque against the artery walls. This creates more space for the blood to flow through the

Currently, the standard treatment for CAD with stable angina includes lifestyle changes, prescription medication and sometimes surgery

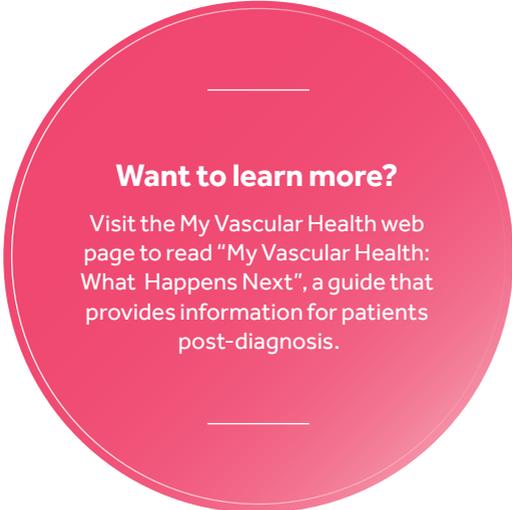
arteries. It is common for stents to be placed in the artery after the procedure to release medication that keeps the artery open. During a bypass surgery, a surgeon creates a graft to re-direct the blood away from the affected artery and through another, healthier artery¹⁸.

PAD

The current standard treatment for PAD is similar to that of CAD and includes lifestyle changes, prescription medication (e.g. antiplatelets) and surgery^{18, 19, 22}.

If you are experiencing acute limb ischaemia as a complication of your PAD, this is usually treated with a procedure called peripheral revascularisation, which aims to restore blood flow. This procedure

**Science and medicine
in vascular health
are moving at a fast
pace in an area called
vascular protection.**



Want to learn more?

Visit the My Vascular Health web page to read "My Vascular Health: What Happens Next", a guide that provides information for patients post-diagnosis.

Related Complications and Conditions

Related Complications

CAD

By having polyvascular disease, CAD can be associated with an increased risk of stroke, if plaque build-up blocks blood flow to the brain⁷, or an increased risk of PAD, if plaque build-up blocks blood flow to the limbs¹¹.

CAD is also associated with an increased risk of heart attack and may even be fatal⁷. A heart attack, also known as a myocardial infarction or MI, occurs when blood flow to the heart decreases suddenly²³. Plaque build-up reduces blood flow and may cause a blockage in the coronary arteries. This plaque can break away, causing a blood clot to form, further restricting blood flow in the artery and reducing oxygen to the heart. Without oxygen, the heart is unable to pump blood normally and, as a result, a heart attack takes place²³.

PAD

PAD patients are at risk of a lack of blood flow to the limbs, otherwise known as limb ischaemia. This occurs when plaque causes blockages in the peripheral arteries, decreasing blood flow to the limbs²⁴.

Two types of limb ischaemia include acute and critical.

Acute limb ischaemia occurs when blood flow to the limb suddenly decreases, and can result in leg pain (claudication)²⁴. Leg pain can also occur if you are not experiencing acute limb ischaemia, and is typically felt while walking or exercising, subsiding with rest²⁵.

Critical limb ischaemia is more serious and occurs when blood flow to the limb is heavily restricted. This can lead to sores, infections that are unable to heal and, as a result, tissue death (gangrene) or even amputation¹².

It is important to note that as blood circulation begins at the heart and the coronary arteries, people with PAD are likely to also have CAD (polyvascular disease), and therefore are at increased risk of experiencing other associated complications such as heart attack and stroke, should plaque build-up block blood flow to the brain^{7,14}.

Related Conditions

Diabetes

Diabetes is a separate condition to CAD and PAD, but can increase ones chances of developing a vascular disease³.

Resulting in abnormally high blood sugar levels, diabetes comes in two forms: type 1 and type 2²⁶.

Type 2 diabetes is linked to obesity and a poor diet, both of which are risk factors of vascular disease²⁶. In fact, over 50% of those with type 2 diabetes will experience symptoms of cardiovascular disease at the time of their diabetes diagnosis²⁷. Type 1 diabetes is a genetic condition caused by an immune deficiency, which is demonstrated when the cells that produce insulin in your body are destroyed by your immune system²⁶. Despite its genetic nature, type 1 also puts you at risk of vascular-related complications such as high blood pressure, heart attack and stroke²⁷.

Vascular Dementia:

The body's blood supply begins at the heart and travels to the other organs. Earlier in this booklet, you read about reduced, or blocked, blood flow in the arteries that provide blood to the heart and limbs (CAD and PAD). Similarly, if plaque builds up in arteries that supply blood to the brain, alongside increasing your risk of stroke, it can also lead to vascular dementia²⁸.

Vascular dementia is caused by a lack of blood to the brain, depriving the brain of vital oxygen and nutrients and causing damage to brain cells. This can lead to difficulty in forming words and sentences, memory loss or a lack of general understanding²⁸.



Key Terms Explained

Acute Limb Ischaemia

A sudden decrease in blood flow to the limbs²⁴. If this progresses to critical limb ischaemia, it can also lead to amputation¹¹.

Amputation

The surgical removal of a body part, such as an arm or a leg²⁹.

Angina

Angina presents in stable and unstable forms, both caused by reduced blood flow to the heart muscle. Unstable angina, the more serious form, can result in heart attack, stroke and even cardiovascular death^{8, 9}.

Angioplasty

An angioplasty, also known as a percutaneous coronary intervention (PCI)²², is a surgery used to treat CAD and PAD, in which a surgeon inserts a tube into the clogged part of the artery and inflates a balloon to compress the plaque against the artery walls. An angioplasty creates more space for the blood to flow through the arteries, thereby supporting the flow of oxygen. It is common for stents to be placed in the artery after the procedure to release medication that keeps the artery open¹⁸.

Arteries

Blood vessels that transport oxygenated blood, or blood rich with oxygen, away from the heart to the organs and tissues².

Atherosclerosis

A disease in which plaque builds up within the arteries, causing them to become narrow and harden, thereby restricting blood flow to the targeted parts of the body. Atherosclerosis is a systemic disease, meaning it affects the whole body, and causes vascular diseases including CAD and PAD³.

Atherothrombosis

Occurs when the plaque within the arteries ruptures and forms a blood clot. If left untreated, a blood clot can grow and completely restrict the blood flow, also restricting the oxygen supply to the organs⁵.

Blood Clot

A natural reaction during injury, in which blood clumps together to prevent the body from losing too much³⁰. If this takes place in the arteries (a process called arterial thrombosis), a blood clot can grow, which can restrict blood flow in the body, and in some cases be fatal³¹.

Bypass

A surgery used to treat CAD and PAD, for which a surgeon creates a graft to redirect the blood away from the blocked vessel and through another open vessel¹⁸.

Cholesterol

A fatty substance carried by the blood that assists with the normal functioning of the body. There are two main types of cholesterol, high-density lipoprotein (HDL) and low-density lipoprotein (LDL). HDL is responsible for carrying the cholesterol away from the cells and to the liver, whereas LDL carries the cholesterol to the cells³².

Claudication

A symptom of PAD defined by severe cramping in the limbs due to restricted blood flow. This is most common in the legs, but can also affect the arms²⁵.

Critical Limb Ischemia

Severely restricted blood circulation to the limb. This can lead to infection, sores, and gangrene, and, if left untreated, can lead to amputation¹¹.

Gangrene

Tissue death, normally as a result of an infection. This is a common complication of critical limb ischemia and can, if left untreated, lead to amputation¹¹.

Myocardial Infarction

A heart attack, caused by a sudden decrease in blood flow within the heart. In the context of vascular disease, a myocardial infarction (often abbreviated to MI) is caused by a blockage in the coronary arteries due to plaque build-up. If this plaque ruptures, a blood clot can form, restricting blood flow within the artery and depriving the heart of vital oxygen, subsequently triggering a heart attack²³.

Plaque

A fatty substance that builds up within the arteries, made up of fat, cholesterol, and calcium. It causes the arteries to harden and narrow, thereby restricting blood flow⁴.

Polyvascular Disease

The presence of more than one vascular disease, such as both CAD and PAD, or cerebrovascular disease³³.

Stroke

Stroke is an example of a serious vascular event that could occur if plaque build-up blocks blood flow to the brain³. There are two types of stroke, ischaemic stroke and haemorrhagic stroke. Ischaemic stroke occurs when blood flow to the brain is restricted, and prevents the brain getting vital oxygen. The brain cells then die, which triggers a stroke³⁴. Haemorrhagic stroke occurs when a blood vessel leaks and bleeds within the brain. This causes pressure and swelling, resulting in damage to the cells and surrounding tissue. Haemorrhagic strokes are less common than ischaemic strokes, accounting for only 15% of stroke events. However, despite their being less common, haemorrhagic strokes account for 40% of stroke-related deaths worldwide³⁵.

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We at Bayer AG can confirm our effort to provide you with factually accurate and relevant information and advice, although we would like to make it clear that the information in this guide is not to be used as a substitute for professional, medical advice.



For more information please visit
www.myvaschealth.com



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