

Blocked arteries and veins: thrombosis and embolism

By PHILIP COLERIDGE SMITH DM MA BCh FRCS

Consultant Vascular Surgeon, Medical Director of the British Vein Institute and Emeritus Reader in Surgery at UCL Medical School

⇒ **DISEASES OF** arteries and veins cause most problems when the affected vessels become blocked. That can happen when a blood clot (thrombus) forms at a particular location and stops the blood flow. Examples of that in the arterial system include heart attack and stroke, when thrombosis affects blood vessels already narrowed by atheroma.

In the venous system, deep vein thrombosis may occur in the legs following injuries or hospital treatment. However, blocked arteries may occur when thrombus forms in one part of the circulation and then detaches from the point of formation and travels as an embolus.



This blood clot formed in the large arteries in the abdomen and travelled to the heart and then to the lungs causing fatal pulmonary embolism

The lower limbs are a common site at which embolism from the heart may come to rest. That leads to acute limb ischaemia, necessitating emergency surgical intervention if gangrene and the need for amputation is to be avoided. As a result of the potential for catastrophic consequences of systemic embolisation, NICE advice recommends lifelong oral anticoagulation in patients with irregular heart rhythms.

The advice from NICE on treatment required to prevent systemic embolisation in patients with irregular heart rhythms is clear and failure to provide that may comprise substandard care.

Pulmonary embolism

A common problem in the venous system is pulmonary embolism, which gives rise to respiratory and circulatory failure. In that condition, a blood clot forms in the leg or pelvic veins and then detaches to travel via the large veins to the heart. The embolus reaches the right side of the heart and passes readily through the atrium and ventricle. It emerges in the pulmonary artery, which normally returns deoxygenated blood to the lungs. The embolus encounters progressively smaller pulmonary arteries and eventually gets stuck, blocking the artery where it comes to rest. The symptoms include chest pain and shortness of breath. Sudden death may occur if the major arteries become blocked in the lungs.

Extensive advice has been published by NICE on preventing deep vein thrombosis which may occur following hospital treatment. Patients presenting at hospital with pain and swelling in the legs may have deep vein thrombosis. NICE has published advice on how that should be investigated and treated in order to avoid fatal pulmonary embolism.

I have advised in cases where inadequate prophylactic measures were provided following hospital treatment, allowing deep vein thrombosis and pulmonary embolism to occur. The required standards are well defined in NICE guidelines, making it clear what standards of care are required.

Arterial embolism

A blood clot forming on the arterial side of the circulation may also cause problems. That may originate in the heart under a number of circumstances, including following a heart attack or in patients with irregular heart rhythms. Following a heart attack, the muscle on the inside of the heart may become damaged – leading to blood clot forming inside the left ventricle. In more elderly patients, coronary heart disease may give rise to atrial fibrillation: a condition in which the atria of the heart beat in a disorganised and irregular manner. That allows blood clot to form inside the left atrium of the heart. Blood clot forming on the inside of the left side of the heart may detach and flow into the aorta, the main artery to the body.

The consequences of an embolism from the left side of the heart entering the circulation depends upon the artery into which it flows. Where an embolism travels via the carotid arteries supplying the brain, a stroke may result. Blocked arm arteries are occasionally seen and the result is upper limb ischaemia. Sometimes an embolus reaches the mesenteric arteries supplying the intestines, leading to mesenteric ischaemia: a condition which is frequently fatal if not rapidly diagnosed and treated.

Embolisation in patients with atheromatous disease

Lower limb arterial disease occurs commonly in smokers, in advancing age and in diabetic patients. Irregular plaques of atheroma form inside the arteries. That potentially affects all the arteries in the body, although those supplying the brain, heart and legs are most commonly affected. If thrombus forms on one of these atheromatous plaques the blood vessel may become blocked, leading to ischaemia of the region supplied by the artery.

However, the combination of the atheroma and thrombus is unstable and pieces of atheroma or thrombus may detach from the artery where they have formed and travel further along the artery. That is frequently seen in the lower limb arteries, where smaller arteries become blocked by atheroma or thrombus travelling as an embolism from larger arteries in the abdomen or pelvis. That in turn may block major arteries in the thigh or calf. Sometimes urgent removal of an embolism from a blocked artery is necessary to restore blood flow to the limb. That can be achieved with a 'balloon catheter', in which a balloon is passed beyond the blocked segment of artery, inflated and withdrawn pulling the embolism with it. Alternatively, various methods of breaking up the embolus with so-called clot-busting drugs are available.

Tiny emboli may travel into the feet and toes. That can happen from an atheromatous plaque that becomes unstable and releases a shower of emboli. The result is sometimes known as 'trash foot', whereby several or many small areas of the foot become ischaemic and die, leading to multiple ulcers. Sometimes, only one or two toes are affected.

Current techniques in vascular surgery do not readily allow restoration of blood flow in the small arteries of the feet and toes. Anticoagulant treatment is useful, but toes or a section of foot become gangrenous and have to be amputated even when the main arteries in the leg are intact.

Expedient treatment is required to manage sudden onset of limb ischaemia and delayed care leading to the need for amputation or ischaemic damage to the limb may be regarded as substandard care.

In conclusion, thrombosis and embolism are common events in the vascular system. In many cases, good standards of medical care should prevent those. Where major embolism occurs, expedient treatment will minimise the effects on the patient. The expected standards of care are defined in NICE advice documents, which provide considerable detail on the methods of management. In many instances that advice will assist in establishing whether substandard care was provided. □

**Mr Philip Coleridge Smith DM MA BCh FRCS
Consultant Vascular Surgeon
Medical Director, British Vein Institute**



20 years

Defendant instructions

Claimant instructions

Single joint expert

Court experience

Areas of experience:

- Surgery of veins and arteries
- Sclerotherapy & laser ablation of varicose veins
- Varicose veins
- Deep vein thrombosis
- Pulmonary embolism
- Leg ulcer
- Lymphoedema
- Peripheral ischaemia
- Injury to blood vessels
- Medical negligence and personal injury

Office address:

British Vein Institute, 24-28 The Broadway, Amersham HP7 0HP

Tel: 0870 609 2389 Fax: 0872 111 7042

Email: p.coleridgesmith@bvi.uk.com

Web: www.medical-expert-witness.co.uk www.bvi.uk.com