

Thrombosis in the time of coronavirus

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⇒ **VASCULAR SURGEONS** deal with the arteries and veins which provide blood flow to and from the tissues of the body. In the arterial system, major problems arise when an artery supplying part of the body becomes blocked. Blood flow provides all the nutrition and oxygen required to maintain the tissues in good health.

Vascular surgeons most commonly deal with the peripheral arteries providing blood flow to the legs. These may become blocked as atheroma (hardening and narrowing of the arteries) progresses and slowly shuts off the blood flow to the legs. Sometimes, thrombus (blood clot) forms elsewhere in the body and then travels in the arteries to block off the blood flow to the leg, resulting in acute limb ischaemia. The leg is cold and white and very painful. The nerves and muscles of the legs can survive for only a short period when the blood flow suddenly stops, and severe damage begins in 4 to 8 hours after acute limb ischaemia begins.

Unless emergency surgery to restore blood flow can be completed within a short period, irreversible damage to the leg arises and an amputation may be required. I have provided advice in several cases in which delayed diagnosis and treatment of limb ischaemia has resulted in avoidable amputation of a limb.

Factors leading to limb ischaemia

The factors underlying limb ischaemia include smoking, hypertension, diabetes and hyperlipidaemia. All of these contribute to the development of atheroma and narrowing of arteries. Diseased arteries may become blocked when thrombus forms in an irregular and already narrowed region of artery.

Factors which give rise to a generalised tendency to blood clotting (thrombophilias) are occasionally responsible for ischaemia when they lead to occlusion of arteries as thrombus forms inside arteries and passes into the extremities. More commonly, thrombophilias give rise to venous thromboses such as deep vein thrombosis and pulmonary embolism.

The role of coronavirus in thrombosis

Now we can add coronavirus infection with COVID-19 to the list of factors which may provoke thrombosis. A number of reports in medical journals describe patients with severe symptoms of COVID-19 infection as suffering gangrene of the fingers and toes. Examination of the affected tissues under a microscope showed that blood clot had formed in the small arteries leading to the fingers and toes. The tissues supplied by the arteries then suffered necrosis (death) leading to gangrene of the extremities.

The patients experiencing ischaemia of the digits were amongst the more severely affected and many did not survive their illness. Possible treatments for this condition might include surgical removal of blood clot, anticoagulant drugs or thrombolytic (clot-busting) drugs. In general, surgical removal of blood clot is only effective in larger arteries and cannot be used successfully in the foot or hand arteries.

The usual management of this ischaemia limited to the fingers is full anticoagulation with heparin. Although this treatment does not remove blood clot directly, it allows the body's own clot removing processes to help improve the blood flow and should prevent extension of thrombosis. Thrombolytic treatment is theoretically useful in ischaemia of the digits but carries the risk of provoking major haemorrhage and its use is more commonly reserved for the management of major limb ischaemia.

The medical literature concerning COVID-19 cases contains further references to thrombotic events affecting other organs. Some patients have suffered stroke due to blocked arteries in the cerebral circulation. Others have experienced blocked arteries in the intestines leading to gangrene of the intestines which is commonly a fatal condition since it leads to bacterial septicaemia.

The reasons for the thrombotic events in arteries remain unclear. It is suggested that in the more severe cases, a 'cytokine storm' plays a role in provoking thrombosis. COVID-19 infection provokes a severe inflammatory response affecting all parts of the body in a limited number of cases and this appears to be provoked by the release of the chemicals which cells use to signal to each other, known as cytokines. Massive release of cytokines leads to failure of many organs including lung, heart, kidneys and the liver and is a poor prognostic sign. It appears that the development of thrombosis in small arteries is one of the consequences of this particular type of cytokine storm.

As yet, there is no scientific evidence to show that these thrombotic events can be managed successfully by anticoagulant drugs.

Thrombosis in the venous system

The main feature in more severe cases of COVID-19 infection is a severe pneumonia affecting both lungs and leading to respiratory failure. This is often investigated by CT scanning of the lungs and the pulmonary vessels. In a substantial number of cases, small thrombi have been detected in the pulmonary arteries as might occur in someone affected by pulmonary embolism. The usual source of such blood clots is from a deep vein thrombosis in the lower limbs. However, in the limited clinical studies which have been done, COVID-19 patients with blood clots in the lungs were not found to have deep vein thrombosis in the legs. The thrombus had formed somewhere in the venous system and had not remained attached to the leg veins before travelling to reach the lungs.

The presence of pulmonary emboli leads to further deterioration of respiratory function and substantial mortality from respiratory failure. Conventional treatment of pulmonary embolism is treatment with therapeutic doses of the anticoagulant drug, heparin. In these particular circumstances, it is not clear how effectively full dose heparin treatment is in managing the pulmonary emboli. In general, this treatment greatly reduces death from pulmonary embolism and therefore its use in COVID-19 patients seems appropriate.

It is recognised that severely ill patients treated in hospital and confined to bed by their illness are at substantial risk of developing deep vein thrombosis in the legs. There appears to be consensus that management of this risk should be addressed in COVID-19 patients by treatment with low-dose heparin injections in keeping with standard advice provided by NICE and in other consensus statements.

Conclusions

COVID-19 infection gives rise to an unusual spectrum of thrombotic events in a pattern which is not commonly encountered in clinical practice. The efficacy of conventional methods of prevention and treatment remains to be shown in such patients.

Litigation in these cases will face significant difficulty in proving both liability and causation in view of the fact that the efficacy of currently used preventive and therapeutic techniques is unknown at present. □

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19 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

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