Case report

Venous gangrene of the lower limbs following aortic valve replacement for native valve endocarditis

Wael I. Awad, Adam Coumbe, Robin K. Walesby

Department of Cardiothoracic Surgery, London Chest Hospital, London, UK
Department of Histopathology, Royal London Hospital, London, UK

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Abstract

Bacterial endocarditis is a complex disease associated with high morbidity and mortality with complications that include acute heart failure and arterial embolism. Venous thrombosis of the lower limbs is not uncommon following all forms of surgery, but infrequent following cardiac surgery, and rarely progresses to venous gangrene. We report a case of bilateral lower-limb venous gangrene, in a 49-year-old female who underwent aortic valve replacement for native valve endocarditis. The possible aetiology of this complication is discussed.

Keywords: Thrombosis; Gangrene; Cardiac surgery; Endocarditis

1. Introduction

Venous gangrene is a rare condition, due to extensive thrombosis in peripheral deep veins. We present a case of venous gangrene of the lower limbs in a 49-year-old female, following aortic valve replacement for native valve endocarditis.

2. Case report

A 49-year-old caucasian female was admitted to her local hospital with a left hemiparesis and pyrexia. Prior to this illness, the patient was well. She smoked 20 cigarettes a day. CT scan of the brain revealed a right parietal lobe infarct. One week later she developed a heart murmur. Trans-oesophageal echocardiogram (TOE) revealed a vegetation on the aortic valve and moderate aortic regurgitation. A diagnosis of bacterial endocarditis was made, blood cultures were taken and the patient was commenced on intravenous antibiotics (vancomycin 1 g b.i.d. and gentamicin 3 mg/kg per day). Unfortunately, she developed another stroke 1 week later and continued to run a swinging pyrexia and a white blood cell count of around 20,000 in spite of 3 weeks of antibiotics. Repeated blood cultures failed to show any organisms. A repeat TOE showed numerous vegetations on the aortic valve. The patient remained haemodynamically stable, but was referred for surgery as a result of uncontrolled infection.

The patient underwent aortic valve replacement with a size 21 mechanical prosthesis. At operation there were vegetations on all three leaflets of the aortic valve. The immediate post-operative course was uncomplicated and the patient was anticoagulated with warfarin. On the third post-operative day the patient developed pain in both feet and a symmetrical discolouration was noticed just below both knees, underneath the elastic stockings. Peripheral pulses which were present pre-operatively, were absent beyond the popliteal arteries. At this stage, the patient’s platelet count was $90 \times 10^9/l$ and the prothrombin time was $2.1 \times$ control. The discoured lower limbs progressed to gangrene (Fig. 1) and the patient developed multi-organ failure. Vascular intervention was thought inappropriate as...
the prognosis seemed grave. The patient died on post-operative day 19.

Post-mortem examination revealed recurrent vegetations at the aortic valve prosthesis and new vegetations on the mitral valve. There were infarcts of the brain, spleen and both kidneys and there were deep venous thromboses in both legs extending into the inferior vena cava. There were no arterial thromboses in the pelvis or lower limbs. Histological examination of the walls of the lower-limb deep veins revealed no abnormality. Enlarged mediastinal lymph nodes were examined histologically and were found to contain metastatic adenocarcinoma, with features suggestive of a bronchial origin. However, macroscopic examination of both lungs was normal.

3. Comments

Bacterial endocarditis is a serious and complex disease, which in many populations continues to occur at an incidence of approximately 20/100,000, and carries a 5–40% mortality [1]. The most common infecting organisms are Streptococcus viridans and Staphylococcus aureus.

Major pre-operative complications occur in as many as 50% of patients [2]. These are mainly embolic and at post-mortem examination it is common to find infarcts of the spleen, kidneys and other organs. Vegetations greater than 10 mm are said to be more likely to embolise [3] and the risk of embolism is also high in patients undergoing surgery because of uncontrolled infection [4]. The other main complication of endocarditis is acute heart failure, from valve dysfunction and abscess formation.

In the uncomplicated patient the initial management is antibiotic treatment, tailored to the microbiology results. In patients unresponsive to antibiotics or with progression of the disease, surgery is the only means of eradicating the infection and restoring cardiac performance and should not be delayed.

The overall incidence of lower limb ischaemia after cardiac surgery is less than 1%. In a retrospective review of 7620 cardiac surgery procedures by Allen et al., 0.85% of patients developed acute lower limb ischaemia, and in 86% of these patients, this was associated with the insertion of an intra-aortic balloon pump [5]. The mortality in those patients developing ischaemia without an intra-aortic balloon pump was 11%.

Venous thrombosis is an uncommon complication after cardiac surgery but carries a high morbidity and mortality. The most serious sequel of venous thrombosis is pulmonary embolism. In a consecutive series of 1033 patients who underwent cardiac surgery, Josa et al. showed an incidence of pulmonary embolism of 3.2%, within 2 weeks of surgery [6]. Pulmonary embolism did not occur in any of the patients who underwent isolated valve replacement surgery.

Factors which may have predisposed this patient to the formation of venous thrombi fall into three main groups. (1) Abnormalities of blood vessel walls due to trauma to the vessel resulting in endothelial damage, or infiltration of the vessel wall by neoplastic disease. The walls of the deep veins in this case were normal, suggesting that other factors were likely to have predisposed this patient to developing venous thrombosis. (2) Diminished rate of blood flow due to stasis, as a result of external pressure on the veins following prolonged bed rest, or to venous pooling as a result of cardiac failure. Hyperviscosity, due to an increase in the cellular components of the blood or severe dehydration, may also result in reduced blood flow within the veins. (3) Increased coagulability of the blood predisposes to thrombus formation. Hypercoagulable states are present during and after surgery and in the presence of infection and malignant disease [7,8] (deficiencies of protein C and protein S and activated protein C resistance). Although resistance to activated protein C is the most frequent coagulation disorder predisposing to venous thrombo-embolism, it is unlikely to have been the cause in this patient, as there was no past history of deep vein thrombosis. In addition, cigarette smoking has several important effects on coagulability. Procoagulant effects have been demonstrated on endothelial function, fibrinogen levels, blood viscosity, fibrinolytic activity and platelet function [9].

This unfortunate case of venous gangrene of the lower limbs...
limbs is extremely rare and probably unique. We have not previously seen this complication of cardiac surgery nor found similar cases in the literature, assuming that this complication did not develop pre-operatively and progressed in the post-operative period. Prophylactic measures against venous thrombosis (including elastic stockings and subcutaneous heparin) were taken in this case, as with all our patients. This patient was adequately anticoagulated throughout her post-operative period and it is difficult to prepare an alternative strategy that could prevent this complication in the future.

References