Aortic regurgitation caused by complex outflow calcification in a patient with chronic renal failure

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Introduction

We present a case of aortic regurgitation caused by a tongue of metastatic calcification in the left ventricular outflow tract, in a man with chronic renal failure. This was followed by severe, calcific stenosis of a bioprosthetic aortic valve 10 months after its insertion.

Case

A 31-year-old man was found to have a serum calcium concentration of 3.65 mmol/l during a community survey in 1976. Abdominal radiography demonstrated widespread, bilateral, medullary nephrocalcinosis and diffuse pancreatic calcification. Serum creatinine concentration was 130 μmol/l. At operation, a parathyroid adenoma weighing 3.5 g was removed.

Over the next 10 years the patient developed hypertension, which was treated with thiazide diuretics, and his serum creatinine concentration slowly increased to 270 μmol/l. It was felt that the chronic renal failure was due to nephrocalcinosis as further investigation revealed no other cause.

Sixteen years after his original presentation, he was admitted to hospital with central chest pain and a diastolic murmur suggestive of aortic regurgitation. Serum creatinine concentration was now 530 μmol/l, serum calcium 2.45 mmol/l, serum phosphate 3.1 mmol/l, and intact serum PTH 72 pmol/l, consistent with secondary hyperparathyroidism of chronic renal failure. Transthoracic and transoesophageal echocardiography demonstrated an unusual calcified mass arising from the posterior wall of the left ventricular outflow tract (Figures 1, 2). The free end of this mass appeared to rise and make contact with the inferior surface of the aortic valve during each left ventricular contraction. There was moderate aortic regurgitation. The next day he developed circulatory collapse and emergency sternotomy was performed. The coronary vessels were calcified and there was calcification of the free wall of the left ventricle. There was a 4-mm perforation in the left coronary leaflet of the aortic valve causing severe regurgitation. This perforation appeared to have been caused by the 2-cm tongue of calcification arising from the ativoventricular septum, which had been seen at echocardiography. There was also calcification of the mitral valve annulus. The damaged aortic valve was replaced by a porcine bioprosthesis and he made an uneventful post-operative recovery. Microscopy and culture of the aortic valve and tongue of calcification revealed no evidence of infection.

Ten months later he presented as an emergency with chest pain. He had a low pulse pressure and an aortic systolic murmur. Echocardiography demonstrated severe calcific aortic stenosis requiring valve replacement. Coronary arteriography demonstrated left coronary main stem vessel disease. At operation there was

Fig. 1. Transoesophageal echocardiography demonstrating tongue of calcification in the left ventricular outflow tract and mitral valve ring calcification. AV, aortic valve; MV, mitral valve; LA, left atrium; LV, left ventricle; RV, right ventricle.
extensive calcification of the bioprosthetic aortic valve. The valve was this time replaced with a metallic prosthesis and bypass grafting of the diseased left coronary artery was performed. He made a slow recovery from the surgery and was fit enough to commence long-term renal replacement therapy by continuous ambulatory peritoneal dialysis (CAPD) 3 months later.

Eight months after starting CAPD he presented with chest pain typical of cardiac ischaemia. The day after admission he suffered an asystolic cardiac arrest and died. At post-mortem he was found to have histological evidence of acute myocardial infarction. There was extensive calcification inferior to the prosthetic aortic valve, and mitral valve annulus calcification was still prominent.

**Discussion**

Metastatic calcification is a well-recognized complication of chronic renal failure [1]. Calcification occurs in arteries, periarticular tissue and in viscerae such as heart and lung. The extent of metastatic calcification in patients with chronic renal failure, appears to be related to the calcium–phosphate product (arithmetic product of serum calcium and serum phosphate concentrations), patient age, and hyperparathyroidism though these relationships have been disputed [2,3]. Our patient had a persistently high serum calcium phosphate product despite prescription of a phosphate restricted diet, and calcium-based and aluminium-based phosphate binders.

There have been a number of studies, using post-mortem examination [3], echocardiography [4–6] and electron-beam computed tomography [7], which demonstrate a high prevalence of aortic and mitral valve calcification and associated valvular dysfunction in patients with end-stage chronic renal failure. Straumann et al. [6] noted aortic stenosis in 8/62 patients on long-term haemodialysis, moderate aortic regurgitation in four of 62 patients, and mild aortic regurgitation of little clinical relevance in a further four of 62 patients. There have been no reports, however, of severe aortic regurgitation, and no reports of aortic valve dysfunction caused by a tongue of calcified tissue arising from the left ventricular outflow tract as occurred in our patient.

The case we report required replacement of an aortic prosthetic tissue valve because of further metastatic calcification 10 months after insertion. This has been reported once before in a patient on long-term haemodialysis with a mitral valve bioprosthesis which had
been in place for 5 years [8]. The authors suggested, for this reason, the use of bioprosthetic heart valves should be reconsidered in patients with end-stage chronic renal failure requiring valve replacement.

**Conclusion**

Calcific valve dysfunction should be considered in patients with chronic renal failure presenting with chest pain, cardiac failure, or syncope. Transoesophageal echocardiography is useful in demonstrating the extent of calcification. Aortic regurgitation caused by complex calcification in the left ventricular outflow tract as described in this report is a rare but life-threatening manifestation of metastatic cardiac calcification in patients with advanced renal failure.

Metallic valve prostheses should be used in most patients with end-stage chronic renal failure requiring cardiac valve replacement in view of the risk of further metastatic calcification of a tissue bioprosthesis.

**References**


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