CMR diagnosis of coronary graft fistula

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The patient is a 54-year old man with a previous history of cerebral aqueduct stenosis and hydrocephalus resulting in malignant hypertension who had surgery for permanent ventriculo-peritoneal shunt. At age 41, he had coronary artery by-pass graft (CABG) surgery with the right internal mammary artery anastomosed to the posterior descending artery and a saphenous vein graft to the first obtuse marginal branch. The patient was recently admitted with pneumonia that rapidly deteriorated and he went in respiratory failure requiring mechanical ventilation. A thoracic CT investigation showed massive bilateral pulmonary infiltrates, pulmonary artery embolism and a large vein graft aneurysm with a maximal diameter of 40 mm (Figure 1 A-B). The management course was complicated with prolonged respiratory failure, persistent infection, despite negative cultures and extended hospital stay. After 50 days of slow recovery the patient was discharged with a need for home oxygen therapy. Ten days later, he was re-admitted with chest pain requiring admission to the coronary care unit where severe pulmonary hypertension was diagnosed with Doppler echocardiography. Troponin-T was mildly elevated, 1,3 μg/L (ref <0.01), CRP was 50 mg/L and chest X-ray showed bilateral lung infiltrates and wide pulmonary vessels. At this point a systolic-diastolic murmur was heard at the left lower sternal edge. With a view of potential coronary re-intervention and to evaluate the pulmonary hypertension, a coronary angiogram and a pulmonary artery catheterisation were performed. This showed a new stenosis in the left anterior descending coronary artery and the pulmonary catheterisation showed a “step-up” in oxygen saturation in the pulmonary artery, suggesting a left-to-right shunt. The vein graft aneurysm did not contribute to the coronary circulation. A cardiovascular magnetic resonance scan revealed a communication between the vein graft aneurysm and the left branch pulmonary artery (Figure 1 C-D), causing a left-to-right shunt with Qp/Qs 2:1. Biventricular systolic function was normal.

In view of the relatively poor pulmonary function and impaired general condition, the initial treatment option was to close the inlet of the vein graft with an endovascular aortic stent (Figure 2). This was successfully achieved but the patient developed infection with raised CRP, early after the procedure, which persisted despite broad-spectrum antibiotics. A critical revision of the vein graft scans revealed air in a thrombus within its cavity, which was considered as the source of infection. A multidisciplinary discussion recommended surgical excision of the vein graft aneurysm and the stent and re-vascularising the LAD with a radial artery graft. At surgery, the aneurysm appeared as mycotic and the procedure was successful without immediate complications, apart from the need to remove a pericardial hematoma on the first postoperative day. The patient recovered and was discharged to a rehabilitation unit three weeks later. A year after surgery the patient went back to a part-time work.

Discussion

Vein graft aneurysm is a well known but uncommon complication to CABG, typically seen years after surgery and predominantly in saphenous vein grafts to RCA (Riahi et al 1975, Ramirez FD et al 2012). Fistulas to the right atrium have already been described (Gruberg et al 1999). As far as
we know, this is the first reported case with a fistula to the pulmonary circulation causing extracardiac shunt. The delay in the final diagnosis was because imaging initially focused on other problems and was performed in an ICU-setting on a compromised patient. CMR clearly mapped the lesion, quantified the shunt and provided accurate anatomical information prior to surgery. The treatment with an endovascular stent was technically and hemodynamically successful but the problem with a potential residual infection persisted. A thrombotic closure of the vein graft was hoped for but did not occur, perhaps because of the reversed flow with pulsatile inflow from the pulmonary artery into the aneurysm as well as by local infection. The surgery was successful but carried the well-known risk related to re-intervention, on a compromised patient and with a potential ongoing but unproved infection. We also stress the importance of careful classic physical examination that might have revealed the diagnosis, including an important shunt, earlier in the course of the disease. A systo-diastolic murmur in the absence of known acquired or congenital heart lesions should call for careful search for rare underlying causes.

**Figure 2:** Transaxial CT image without contrast (A) and intraprocedural left anterior oblique aortic angiogram (B). The endovascular stent is in situ in the ascending aorta (arrows). Note that the aneurysm is partially filled with thrombotic material (A). The positioning of the stent carefully avoiding the native coronary ostia (B).

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