Abdominal aortic aneurysm after pulmonary transplantation: A case report

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We present the case of a 39-year-old man who underwent repair of a symptomatic 5-cm abdominal aortic aneurysm. This patient had received a bilateral lung transplant for cystic fibrosis 10 years before this event. He was receiving cyclosporine, prednisone, and azathioprine as immunosuppression therapy. To our knowledge, this is the first reported abdominal aortic aneurysm after lung transplantation, and we note that our patient had a rapidly enlarging aneurysm, as seen in recipients of heart transplants. We postulate that immunosuppression may be related to the development and/or rapid growth of abdominal aortic aneurysms. (J Vasc Surg 2000;31:585-8.)

There are many reports describing the development of abdominal aortic aneurysms (AAAs) after renal and cardiac transplantation.[1-6] The incidence of AAAs seems to be high in patients who undergo heart transplantation, particularly when the indication for the transplantation is end-stage coronary artery disease.[1,2] These aneurysms are also noted to enlarge at more rapid rates than seen in the non-transplantation population.[4] We recently treated a young patient in whom an AAA developed 10 years after the lung transplantation. In the 18 months before repair, the aneurysm also expanded quite rapidly. In common with cardiac transplant recipients, our patient underwent immunosuppression therapy with cyclosporine, azathioprine, and prednisone. We will examine the possibility that these medications have a role to play in the development and expansion of AAAs.

CASE REPORT

The patient was a 39-year-old man with a history of cystic fibrosis for which he underwent a double lung transplantation in 1988. During a work-up for unexplained weight loss 18 months before admission, a 4-cm AAA was noted on the computed axial tomography scan. An ultrasound scan performed just 2 weeks before admission showed that the AAA was now 5 cm in diameter. At that time, the patient was asymptomatic, and an elective aneurysm repair was being planned. On the day of admission, the patient was taken to the emergency department with acute onset of severe epigastric abdominal pain with radiation to the back.

His medical history includes renal failure as the result of cyclosporine toxicity for which he was undergoing hemodialysis. He also had a cardiomyopathy with severe mitral valve regurgitation and an ejection fraction of 25%. The patient was doing well from a pulmonary point of view. He was not smoking nor was he known to be hyperlipidemic. The patient's condition had been maintained with prednisone, cyclosporine, and azathioprine since the transplantation. Other medications included digoxin, lisinopril (Prinivil), and metoprolol.

Physical examination revealed an anxious gentleman in a mild amount of distress. His pulse was 81 and he was not hypotensive. His abdominal examination showed a midline scar from a previous laparotomy and a pulsatile aortic aneurysm that was now tender. He had easily palpable peripheral pulses. Laboratory analysis showed a hemoglobin level of 146 g/L and a creatinine level of 555 μmol/L, in keeping with his known renal failure. A computed axial tomography scan of the abdomen with contrast showed a 5-cm infrarenal AAA with no evidence of rupture (Fig 1). The scan also showed a 2.1-cm splenic artery aneurysm in the proximal third of the artery (Fig 2).

An emergency operation was performed for the patient's symptomatic AAA. A midline laparotomy was performed, and multiple adhesions from previous surgical procedures were taken down. There was no evidence of rupture or leak from the aneurysm, which was 5 cm. No

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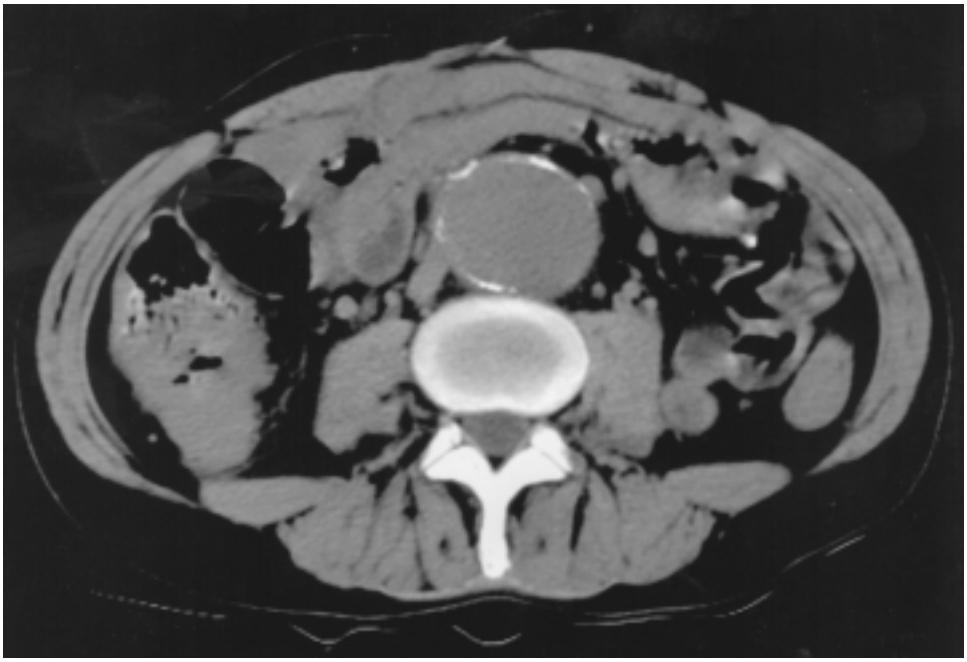

Fig 1. Nonenhanced CT scan shows a 5-cm infrarenal AAA without evidence of leak or rupture.

unusual features about the aneurysm itself were noted; it had the appearance of a typical atherosclerotic aneurysm. The proximal left iliac was aneurysmal as well. The aneurysm was repaired in a standard fashion with a bifurcated 14 × 7-mm graft from the infrarenal aorta to the common iliacs on both sides. The splenic artery aneurysm was ligated both proximally and distally without removal of the spleen. The patient was given stress-dose steroids, and immunosuppression was continued after the operation through the nasogastric tube. The patient underwent extubation immediately after the operation and received an epidural infusion for pain control. There were no major complications after the operation, and he was discharged on the postoperative day 6. He is doing well now, 5 months after the operation. A duplex scan performed 3 months after the operation showed flow in the distal splenic artery only, and the aneurysm was not visualized.

DISCUSSION

There have been a number of reports recently on the occurrence of AAAs in cardiac transplant recipients.[1-4] The aneurysms are morphologically the same as in the nontransplantation population and distinct from the mycotic thoracic aortic aneurysms that occur in the setting of mediastinal sepsis after the operation. The development of AAAs in patients undergoing cardiac transplantation is an important problem, and patients undergoing transplantation for ischemic cardiomyopathy seem to be at particular risk.[1,3,4] Pitrowski et al[2] found that 4.3% of all the cardiac transplant recipients they studied had AAAs, and in the subgroup of patients who had ischemic cardiomyopathy as the indication for transplantation, the incidence rose to 10.5%. The development of AAAs in cardiac transplant recipients may be a manifestation of their tendency to experience the development of peripheral vascular disease in general.[5] However, these aneurysms do not occur exclusively in the group who undergoes transplantation for ischemic cardiomyopathy, and other factors may be involved. There are many reports of AAAs after kidney transplantation, but the precise incidence of this problem in any single group of transplant recipients is not documented because most reports tend to concentrate on the technical aspects of the procedure.[6]

A very important and uniformly observed feature about AAAs in the cardiac transplantation population is that they enlarge rapidly.[1,2,4] Ammori et al[4] reviewed the literature and found a mean aneurysm growth rate of 1.10 cm/year in AAAs that were diagnosed after cardiac transplantation. In contrast, a 10-mm growth of an AAA in 1 year is expected in less than 0.3% of aneurysms discovered in the population at large.[7] Pitrowski et al[2] studied 98 cardiac transplant recipients with routine ultrasound scans

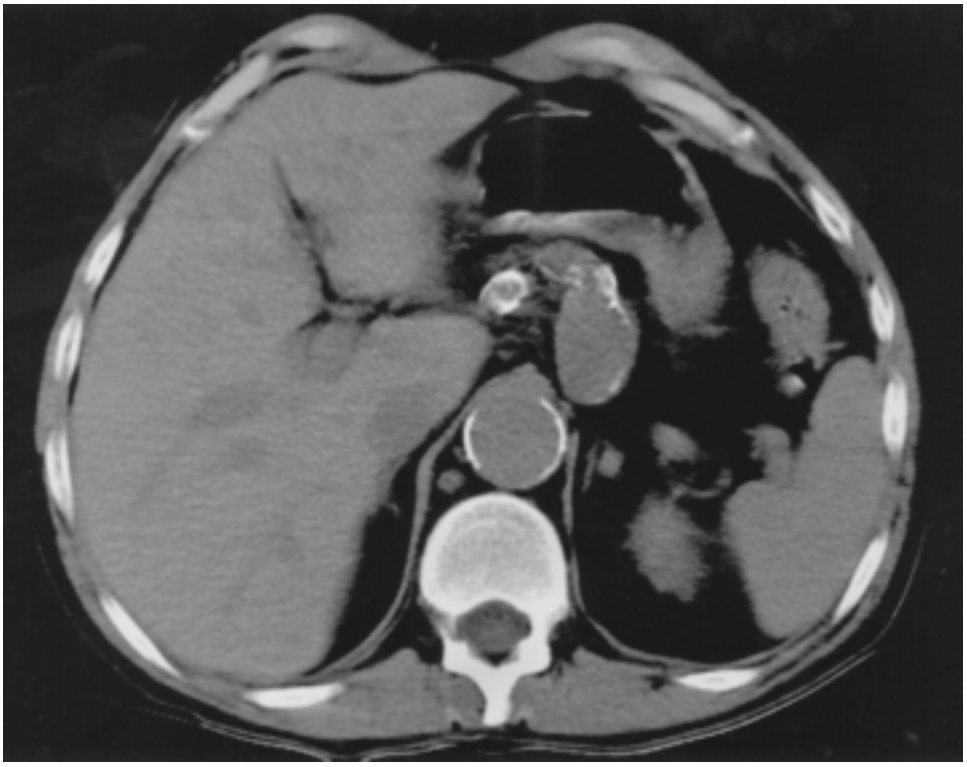

Fig 2. A 2.1-cm splenic artery aneurysm in the proximal portion of the artery.

before and after cardiac transplantation. They found five AAAs in this group. Four of the five AAAs were actually present before the transplantation, and all four AAAs expanded rapidly after the transplantation. The rapid growth of even small aneurysms may well be the main reason that there is a high incidence of clinically apparent AAAs in this population. Factors that have been proposed to have a role in this rapid expansion include the significant hemodynamic alterations after cardiac transplantation associated with improved cardiac function and the effects of cyclosporine and prednisone therapy.

To date there have been no AAAs described in patients after lung transplantation. The number of lung transplantations performed each year is much lower than the number of kidney or heart transplantations. As of 1994, there had been over 2700 lung transplantations performed worldwide with 1- and 3-year survival rates of 70% and 56%, respectively.[8] There are thus many fewer survivors of lung transplantations than of the other solid organ transplantations. Also, the indications for lung transplantation are quite different, with primary pulmonary hypertension, chronic obstructive pulmonary disease, Eisenmengers syndrome, and cystic fibrosis being the major indications. One might expect a lower incidence of underlying atherosclerotic disease in this population, because they are younger than the heart transplant recipients.

The AAA developed in our patient at a very early age, and in 18 months it had expanded at a rate of 0.7 cm/yr. The behavior of his AAA was as seen in the cardiac transplant population, and this occurred in the absence of markedly improved hemodynamics (his ejection fraction was 25%). It is also of interest to note that our patient's aneurysm expanded rapidly although he was undergoing metoprolol therapy. Recent studies indicate that the effect of beta-blockers may be to slow the growth rate of AAAs.[9] It could be that our patient's long-term use of prednisone, cyclosporine, and azathioprine was an important factor in the development and expansion of the AAA, as it is in the cardiac transplant population. Given the age of our patient and the fact that two aneurysms had developed, the possibility of connective tissue disease cannot be eliminated. Cystic fibrosis is not known to affect the vascular system nor is it known to be associated with connective tissue disease. In theory, the enzymatic defect involved in this disease should not affect large arteries.

Studies in animal models have shown that prednisone can have a proaneurysmal effect and even induce rupture in a rat model of aortic aneurysm.[10] There is circumstantial evidence linking long-term use of prednisone with the development of atherosclerosis.[11] Aneurysm disease seems to be more common and develops at an earlier age in patients receiving chronic steroid therapy for autoimmune diseases.[12] Cyclosporine is not known to induce aneurysmal disease. Research investigating the possible role of cyclosporine in accelerated graft atherosclerosis has shown that, in animal models, cyclosporine can have a directly atherogenic effect on injured vessels.[13] Prednisone and cyclosporine can cause patients to be hypertensive and in this way conceivably can predispose a patient to vascular disease and aneurysms.[2] The experimental evidence is far from conclusive. Based on the supposition that the inflammatory infiltrate seen in AAAs may be the cause of enlargement and rupture, Dobrin et al[14] reported that the administration of cyclosporine and prednisone actually inhibited the development of aneurysms and aortic enlargement in a specific animal model. The clinical experience thus far with patients who have undergone transplantation and are receiving prednisone and cyclosporine therapy seems to contradict this observation.

In conclusion, our patient is the first patient with described AAA after a lung transplantation. His condition and the rapid growth of the aneurysm is similar to that seen in patients after cardiac transplantation. This leads us to speculate that the similar immunosuppressive regimes are important etiologic agents. It may be that aneurysms in the lung transplant population will behave as do those aneurysms in the cardiac transplant group. If this is the case, these aneurysms should be aggressively managed. It has even been advocated that all aneurysms in patients who have undergone a cardiac transplantation be repaired, regardless of size. Based on this case and the reported experiences of other authors with heart transplant recipients, we feel that, if one elects not to immediately repair an abdominal aneurysm in any transplanted patient, serial follow-up of the aneurysm should be performed more frequently than for the aneurysm population at large. The aneurysms should be repaired expeditiously if any abnormally rapid growth is noted. As the number of survivors of all types of transplantations increases, more data may become available on the impact of aneurysmal disease in these patients, and hopefully we can develop a clearer understanding of the exact role of steroids and immunosuppression in the development and expansion of AAAs.

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