

HEART

Editorial

Routine coronary angiography after heart transplantation

One of the major problems following heart transplantation is the development in the graft of an aggressive form of vasculopathy (cardiac allograft vasculopathy, CAV). This leads to occlusive coronary artery disease characterised by intimal hyperplasia, which differs from native coronary atheroma in being diffuse, concentric, and predominantly distal, with the internal elastic lamina intact until a late stage.¹ CAV is detectable angiographically in 40–70% of heart transplant recipients five years after transplantation² but is underestimated by angiography because of its diffuse concentric nature. Using intracoronary ultrasound it is possible to demonstrate intimal thickening in most patients by the end of the first year.³

Most heart transplant centres perform regular surveillance coronary angiograms, often annually. We recently reviewed our policy of biannual coronary angiography after transplantation⁴ and believe that the risk to the patient and cost can no longer be justified.

Wythenshawe experience

Between April 1987 and September 1995 we performed 278 angiograms on 155 (of 215) heart transplant recipients. The majority of these was performed according to protocol—a small number was performed to investigate chest pain or unexplained deterioration in graft function. Coronary artery disease was identified in 30 patients. Two patients underwent coronary angioplasty with good results: one patient had unstable angina and the other had exertional ischaemia on exercise testing. Several complications occurred in relation to angiography: in one patient dissection of the right coronary artery precipitated non-fatal myocardial infarction; two patients required surgical repair of a false aneurysm of the right femoral artery; and three had symptomatic bacteraemia (fever and malaise with positive blood culture) one to three weeks after the procedure.

The cost of the diagnostic procedures (not including complications or percutaneous transluminal coronary angioplasties (PTCAs)) was £130 000 (£470 per procedure—1995 price of an angiogram at Wythenshawe).

Radiation exposure

In addition to the immediate complications of angiography, the patients were exposed to radiation. The magnitude of the risk is uncertain, but it has been estimated that for a normal individual the chance of contracting a fatal malignancy as a result of a coronary angiogram is 1 in 2800 (AP Hufton, personal communication). This risk may be greater for immunosuppressed populations and is compounded by frequent examinations. Transplant patients have invariably undergone many radiological procedures prior to transplantation, and continue to require

them afterwards. If a patient survives 10 years must they also undergo five to 10 further coronary angiograms? We know that malignancy is common among transplant recipients, we do not know to what extent routine coronary angiography might contribute to the risk.

Revascularisation for CAV

To assess the potential therapeutic benefits of surveillance coronary angiography it is necessary to consider the treatment of CAV. Revascularisation may be performed by PTCA or coronary artery bypass grafting (CABG). Both procedures are less effective than for native coronary disease because of the diffuse and distal nature of CAV. The largest report of revascularisation after transplantation is from 13 centres in the United States in which 3710 patients had heart transplants between 1968 and 1991.⁵ Sixty six patients had PTCA (97 procedures, 94% initial success, two periprocedural deaths, 55% angiographic restenosis at eight months); 11 had directional atherectomies (two periprocedural deaths); and 12 had CABG (four perioperative deaths). The most common indication for these procedures was the angiographic observation of coronary artery disease. Although the conclusion of this report was that the initial success rate of PTCA was comparable to that of native vessel angioplasty, the complication and death rates were substantial, and the restenosis rate was high. Experience of CABG and atherectomy was very limited but the results do not look encouraging.

More recently, transmyocardial revascularisation by laser has been described in a small number of heart transplant recipients,⁶ although its benefit has not been established. CAV can also be treated by retransplantation, but limited donor organ supply presents difficulties and the results for retransplantation are not as good as for a first transplant.

Intracoronary ultrasound

One of the benefits of routine coronary angiography in recent years has been through the application of concomitant intravascular ultrasound techniques. This has expanded our understanding of CAV, and further emphasised the limitations of angiography as a gold standard for this condition. A correlation has been shown between prognosis and the extent of intimal thickening.⁷ More recently, morphometric techniques have allowed an accurate, repeatable assessment of the disease burden in a vessel by the use of an elegant random sampling technique to generate an intimal index.⁸ These techniques, although they have shown no practical benefit to patients, are ideally suited to assessing the impact of therapies upon the progress of the disease.

Angiography for research

The last reason for performing surveillance angiography is as a research tool. Without it our knowledge of the appearance and natural history of CAV would undoubtedly have been much poorer. If we stop doing it we may miss a change in the pattern of CAV attributable to some change in practice. However, such uncontrolled retrospective research has very limited power to answer important questions, and it is no longer reasonable to subject patients to angiography for such doubtful and speculative reasons without their explicit consent and without the approval of local ethical committees.

Conclusions

What then of routine coronary angiography after heart transplantation? In patients who are well the benefit is dubious. Treatment is unlikely to make the patient feel better or to improve the prognosis.

We believe that the practice of surveillance coronary angiography following heart transplantation answers few clinical questions and leads to a low rate of revascularisation, much of which may be inappropriate. It is costly and exposes the patient to risk, both from the procedure and from repeated radiation exposure. We have abandoned the practice and believe that coronary angiography should

be used when clinical questions need to be answered and in well designed clinical trials (which will include the use of intracoronary ultrasound) directed at the important problem of transplant coronary artery disease.

SCD GRANT
NH BROOKS
RD LEVY

Department of Cardiology,
Wythenshawe Hospital,
Manchester, United Kingdom

- 1 Hosenpud JD, Shipley GD, Wagner CR. Cardiac allograft vasculopathy: current concepts, recent developments, and future directions. *J Heart Lung Transpl* 1992;11:9-23.
- 2 Scott CD, Dark JH. Coronary artery disease after heart transplantation: Clinical aspects. *Br Heart J* 1992;68:225-6.
- 3 St Goar FD, Pinto FJ, Alderman EL, Valentine HA, Schroeder JS, Gao S-Z, et al. Intracoronary ultrasound in cardiac transplant recipients: in vivo evidence of angiographically silent intimal thickening. *Circulation* 1992;85:979-87.
- 4 Grant SCD, Elgamel A, Brooks NH, Levy RD. Routine coronary angiography after heart transplantation: time to stop [abstract]. *Heart* 1996;75(suppl 1):P66.
- 5 Halle AA, DiSciascio G, Massin EK, Wilson RF, Johnson MR, Sullivan HJ, et al. Coronary angioplasty, atherectomy and bypass surgery in cardiac transplant recipients. *J Am Coll Cardiol* 1995;26:120-8.
- 6 March RJ, Guynn T. Cardiac allograft vasculopathy: the potential role for transmural laser revascularisation. *J Heart Lung Transpl* 1995;14(part 2):S242-5.
- 7 Mehra MR, Ventura HO, Stapleton DD, Smart FW, Collins TC, Ramee SR. Presence of severe intimal thickening by intravascular ultrasonography predicts cardiac events in cardiac allograft vasculopathy. *J Heart Lung Transpl* 1995;14:632-9.
- 8 Johnson JA, Kobashiwaga JA. Quantitative analysis of transplant coronary artery disease with the use of intracoronary ultrasound. *J Heart Lung Transpl* 1995;14(part 2):S198-201.

STAMPS IN CARDIOLOGY

Joseph Leopold Auenbrugger (1722-1809)

This Austrian stamp is part of the Welfare Funds issue from 1937 featuring famous Austrian doctors. The stamps, in addition to the postal rate, bear a surcharge for the charity. Other stamps in the set of nine feature among others Rokitansky, Skoda, van Swieten, and Billroth.

The publication of Joseph Leopold Auenbrugger's *Inventum Novum ex Percussione Thoracis Humani* in 1761 (devoted entirely to immediate percussion), and the promotion of his work 47 years later by Jean Nicholas Corvisart with the translation of his treatise, brought the art of percussion into clinical diagnostic use. He was the son of an innkeeper and used to tapping barrels to estimate how much wine they contained. He described the dull note over the position of the heart in the thorax (sonus carnis) and the findings on percussion in pericardial effusion and in cardiac enlargement. He studied in Vienna and was assistant physician at the Spanish Hospital. He was also an accomplished musician, which perhaps enabled him to appreciate percussion note abnormalities in patients with pulmonary and cardiac disease. He wrote the libretto for Antonio Salieri's comic opera *The Chimney Sweep*.

M K DAVIES
A HOLLMAN

