PRACTICE OBSERVED

Routine hospital based follow up for patients with mechanical valve prostheses: is it worthwhile?

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Patients who have undergone valve replacement surgery remain at risk of serious and potentially life threatening complications long after their initial surgery. The risk of death from valve related complications has been estimated at approximately 1% per annum.¹ As a consequence lifelong routine follow up of patients with prosthetic heart valves in hospital cardiac clinics is often advocated.^{1 2} However, the precise form that follow up should take and whether continued hospital surveillance influences outcome is unclear. The distinct natural history of bioprosthetic and mechanical valves suggests that the value of routine follow up screening in the two groups may differ and that for patients with mechanical valves the usefulness of regular hospital visits may be questionable.

Late complications of prosthetic valve surgery can be broadly considered in two groups. The first of these relates to the potential for valve thrombosis and arterial thromboembolism, and to the complications of anticoagulant treatment intended to prevent these events. These complications are minimised by optimal monitoring of anticoagulant control. In current practice this is typically undertaken by the general practitioner or in specialised anticoagulant clinics separate from the general cardiology clinic.

The second group of complications comprises problems unrelated to anticoagulant control, principally those resulting from the haemodynamic consequences of valve malfunction and the potential for infection. These represent the target of routine hospital surveillance. However, there is little definitive evidence that screening for this group of complications, typically performed on an annual basis, permits more successful intervention than would be afforded by investigation at the time of symptomatic presentation. Paravalvar leaks in the absence of infection are usually related to technical problems at the time of surgery, and actuarial freedom from paraprosthesis leak exceeds 98% at five years.^{3 4} In contrast to bioprosthetic valves, failure of mechanical valves is rare and usually catastrophic.

Despite the uncertain benefits of screening, there are inevitable consequences for resources. In Aberdeen, we evaluated the impact of routine cardiology follow up of patients with mechanical valves, first by a prospective audit

of outpatient visits and second by a retrospective review of patients with mechanical prosthetic valves undergoing repeat cardiac surgery.

Prospective audit

In the prospective audit, 100 visits of patients with mechanical valve prostheses attending for routine cardiological follow up were assessed. Consecutive patients were studied during two periods from March 1996. Patients were excluded if their appointment date had been brought forward at the general practitioner's request or following hospital admission, or if they had not had two or more previous clinic visits. Patients were seen by cardiologists in training grades with varying experience in accordance with the normal practice in the clinic.

The 100 outpatient visits studied involved 93 patients (52 female, 41 male; mean (SD) age 64 (12) years). The site of mechanical valve prosthesis was aortic in 46 patients, mitral in 40, and seven patients had both mitral and aortic prostheses. A wide variety of valve types was represented (table 1). Between 1 and 23 (median 5) years had elapsed since the most recent surgery. Investigations ordered are shown in table 2. Echocardiography was the most frequently performed investigation, undertaken on 50 visits and including 40 asymptomatic patients.

Twenty visits led to either a change in treatment or increased frequency of surveillance, but of these only seven had not been preceded by a clear change in symptoms (tables 3 and 4).

Review of redo valve surgery

The review of redo valve surgery used the computerised database of surgical procedures to identify all redo valve surgery performed between 1990 and 1997. Retrospective note review was then used to identify those patients with mechanical valve prostheses who had undergone further surgery more than six months after the original procedure, and to determine both the indication for repeat surgery and the manner in which the patient had presented. Evidence was sought from the preceding routine follow up visits for any indication that the problem leading to further surgery had been identified.

Table 1 Mechanical valves represented in the outpatient audit

Valve type	n
Aortec	18
ATS	4
Sorin	14
Starr Edwards	5
Carbomedics	5
Bjork Shiley	32
St Jude	18
Medtronic	3

Table 2 Summary of investigations ordered

Investigation	n
Echocardiography	50
"Blood"	29
Chest radiography	7
Holter	3
Lung function	2
Coronary angiography	1
No investigations	38

Only eight patients (three female, five male; age 62 (8) years) with mechanical valves underwent late redo valve surgery during this time (table 5). In all cases repeat surgery followed re-referral through the general practitioner or casualty department between regular follow up visits for a problem not identified at the preceding clinic visit. In seven of the eight cases important new symptoms precipitated urgent or emergency referral. In the remaining case the general practitioner identified a new murmur not previously noted during a consultation for an independent problem and arranged early review. Redo valve surgery in this case preceded the next scheduled routine review appointment.

Comment

These results support the contention that, as currently practised, routine outpatient review in this patient group has limited therapeutic impact, and that this impact is predominantly confined to those with new symptoms. In these series there were no cases in which routine review identified a serious potentially remediable problem in an asymptomatic patient. The survey also confirms that this form of outpatient follow up consumes significant resources. There was striking variation in the degree to which asymptomatic patients were investigated, particularly by echocardiography. While some of this variation is likely to have been driven by the presence or absence of abnormal physical signs on examination, review of patient records suggested that a more important source of variation was the lack of consensus as to whether routine echocardiography was an integral part of routine "follow up."

Inevitably the population of patients with mechanical valves includes a group with considerable comorbidity, particularly left ventricular dysfunction but often also arterial disease. It is to be expected that some would derive therapeutic benefit from attendance at a cardiac clinic. In accordance with this, the most frequent interventions seen in our survey related to treatments for heart failure. Whether this is adequate to support the principle of routine lifelong follow up for all is less clear. Neither left ventricular dysfunction nor arterial disease is usually considered a mandate for indefinite routine follow up. A parallel can be drawn with patients undergoing surgical revascularisation for coronary artery disease who are

Table 4 Therapeutic changes in asymptomatic patients

Treatment change	n
ACE inhibitor dosage	2
Diuretic dosage	2
Warfarin dosage	1
Rate control (atrial fibrillation)	1
Antihypertensive therapy	1
Total	7

ACE, angiotensin converting enzyme.

Table 5 Indications for redo surgery in patients with mechanical valve prostheses

Indication	n
Valve thrombosis	2
Infective endocarditis	3
Paravalvar leak (infection not proved)	3
Total	8

no longer routinely followed in the majority of centres.

Importantly, a conclusion that the impact of routine review is limited may equally reflect shortcomings in the way hospital based review is practised, rather than suggesting that review is unnecessary in principle. Typically, patients with mechanical valve prostheses are followed up by comparatively junior members of staff, and follow up is often devolved to district general hospitals remote from the tertiary centre at which the valve surgery was undertaken. In the light of our findings it would seem legitimate to suggest that follow up for many patients could be devolved further to the general practitioner. In the audit described, the only patient in whom abnormal physical signs in isolation marked a potentially threatening valve problem was detected by the general practitioner independently of hospital follow up.

The Aberdeen audit is clearly too small to provide a definitive answer concerning the value of follow up. Such a small sample may not be representative of outpatient review in general, and there may be other less tangible benefits of routine outpatient review such as the opportunity to reinforce advice concerning endocarditis prophylaxis. Furthermore, although it is striking that in each of the eight cases undergoing repeat surgery, presentation occurred between routine follow up visits, we have to acknowledge the constraint that Aberdeen is a relatively low volume surgical centre. However, the optimal study—in which a cohort of patients is randomised prospectively to routine long term follow up or no routine follow up—is unrealistic. Not only would ascertainment of end points in the group "not being followed up" present substantial potential for confounding but the small number of meaningful end points and the heterogeneity of the population would suggest an impractical study size and duration.

Persuasive evidence exists neither for nor against routine hospital based follow up of patients with prosthetic valves. It is inevitable that a judgment has to be made without definitive data, based on the information available and the biological plausibility that infrequent hospital visits have significant advantage in the early detection of valve related complications. Routine hospital based

Table 3 Therapeutic changes in symptomatic patients

Admitted (n = 3)	Heart failure Heart failure "Collapse" in clinic	Severe LV impairment Failing xenograft* No cause identified
Outpatient treatment (n = 10)	ACE inhibitor/diuretic treatment Referral to ENT Referral for sternal wire removal Non-cardiac dizziness (Serc) Possible TIA—warfarin dose altered Antihypertensive treatment	4 2 1 1 1 1
Total		13

*Mechanical aortic valve replacement with bioprosthetic mitral valve replacement.

ACE, angiotensin converting enzyme; LV, left ventricular; TIA, transient ischaemic attack; ENT, ear nose and throat department.

follow up is a legacy of an era when the natural history of patients with mechanical valve prostheses was less well known, primary care services were less well developed, and the information technology to allow ready recall of patients was not available. With current constraints on healthcare resources, any routine screening programme requires evidence of efficacy. Selected patients undoubtedly require long term follow up—for example, those with significant paravalvar leaks detected early after surgery—but for the majority of asymptomatic patients with mechanical valve prostheses long term routine hospital follow up may be

unnecessary provided there are appropriate alternative anticoagulant follow up arrangements and rapid access for patients with new symptoms.

- 1 Grotte GJ, Rowlands DJ. Long term management of patients with prosthetic heart valves. In: *Recent advances in cardiology*, vol 11. Edinburgh: Churchill Livingstone, 1992:271–94.
- 2 ACC/AHA Practice Guidelines. Guidelines for the management of patients with valvular heart disease. *Circulation* 1998;98:1949–84.
- 3 Blackstone EH, Kirklin JW. Death and other time related events after valve replacement. *Circulation* 1985;72:753–67.
- 4 Tatoulis J, Chaiyaroj S, Smith JA. Aortic valve replacement in patients 50 years old or younger with the St Jude Medical valve. 14 year experience. *J Heart Valve Dis* 1996;5:491–7.

IMAGES IN CARDIOLOGY

Right atrial thrombus from an adrenocortical carcinoma

A 21 year old hypertensive woman was admitted because of a one month history of lower limb oedema. On examination, her blood pressure was 160/110 mm Hg and she had a tachycardia of 95 beats/min. She had hepatomegaly and a large palpable abdominal mass. Abdominal computed tomography (CT) (top) showed a retroperitoneal mass of 15 × 10 cm that was attached to the left kidney, with venous tumour thrombus extension in the inferior vena cava (IVC) up to the right atrium and involving both renal veins. Urgent echocardiography (bottom) showed complete filling of the right atrium with thrombus; blood flow was limited to a 2 mm channel along the interatrial septum. Chest radiography and abdominal CT showed liver and lung metastases. Steroid metabolism was not studied; urinary excretion of vanillylmandelic acid and metanephrines had been normal six days previously.

Because of the intracardiac extension of the thrombus, cardiac bypass surgery was performed with en bloc extraction of the atrial and IVC tumour thrombus. The primary tumour, which was found to be of adrenal origin, was removed. Postoperatively, the patient developed an areflexic coma with extensive cerebral oedema related to cerebral metastases. She died some hours later. Histological analysis showed an adrenocortical carcinoma.

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