Viewpoint

The arterial organ in cardiovascular disease: ADAPT (arterial disease assessment, prevention, and treatment) clinic

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The arterial tree is one of the most intriguing and, undoubtedly, the most ubiquitous, of the body's organs. It is not, however, commonly thought of as an organ at all, but considered in isolation according to the specialty best suited to managing the presenting symptoms, such as cardiology, nephrology, or neurology. The reality, however, is that an insult to any part of the circulatory system is a threat to the arterial organ as a whole, and management of disease in one part should be common to management of that in another, although the local symptoms may require interventional skills peculiar to the affected area. For example, the cardiac surgeon tends to direct his skills to coronary-artery bypass surgery, whereas the vascular surgeon develops skills in reparative procedures for the aorta and major blood vessels. With the development of radiological skills in angioplastic and stenting techniques, these barriers are starting to break down, but the management of the underlying central disease process, generally atherosclerosis in one form or another, is commonly haphazard and dependent on which of the cardiovascular routes the patient has taken. Superlative interventional procedures are often successfully performed without attention being given to the continuing need for risk-factor management and therapy to protect the arterial organ as a whole and maintain reparative processes.[1] Each specialty works on a particular organ, and generally ignores the likelihood that other organs may be threatened by occlusive disease of the arterial system elsewhere. Logical practice should, however, demand comprehensive assessment of the entire circulatory system. We established the arterial disease assessment, prevention, and treatment (ADAPT) clinic to try to achieve these goals.

The concept

A man aged 55 years was referred to our unit because his family physician had recorded a blood pressure of 160/95 mm Hg during a check-up. The patient had not been seen by a doctor for 5 years. Previously, he had developed calf pain when playing golf and had been referred by his family physician to a vascular surgeon with a diagnosis of intermittent claudication. A femeropopliteal bypass cured his symptoms and, after one postoperative visit, he had been discharged back to the care of his family physician. He had not attended for follow-up until his wife urged him to have the check-up, which resulted in the present referral. The patient denied any cardiovascular symptoms. He managed a small business and played 18 holes of golf at least twice a week. He had not smoked since his operation, his intake of alcohol and salt was moderate, and he was about 2 kg overweight.

Apart from a raised blood pressure of 154/92 mm Hg and absent pedal pulses bilaterally without notable tropic changes, clinical examination was unremarkable. Positive investigations were: fasting cholesterol 8·4 mmol/L; triglycerides 1·6 mmol/L; HDL fraction 1·50 mmol/L; LDL fraction 6·90 mmol/L; blood pressure in the clinic 168/102 mm Hg; ambulatory daytime blood pressure 152/91 mm Hg; and night-time blood pressure 132/84 mm Hg. Renal function, electrocardiography, and echocardiography were normal.

This case is not unusual and many doctors who run cardiovascular clinics will be familiar with many such patients. However, on further investigation, this patient's hospital notes from the time of femeropopliteal bypass showed some notable findings. Blood pressure was recorded as at or just above 150/90 mm Hg on three occasions, although normal on others. He had also a fasting serum cholesterol of 6·9 mmol/L. Although the patient was generally well and symptom-free 5 years after his bypass, the state of his graft might have been healthier if the risk factors of mild hypertension and hypercholesterolaemia had been aggressively managed from the outset, but borderline hypertension and hypercholesterolaemia did not then attract the same attention they do now.

Therefore, after thought about this patient's disorder and the state of his arterial system, the concept of the ADAPT clinic developed. The facility was seen as one that would enable assessment, management, and treatment of all cardiovascular patients, whatever their presentation, according to a common protocol.

Selling the concept

The ADAPT clinic was conceived to coordinate the management of arterial disease, irrespective of the

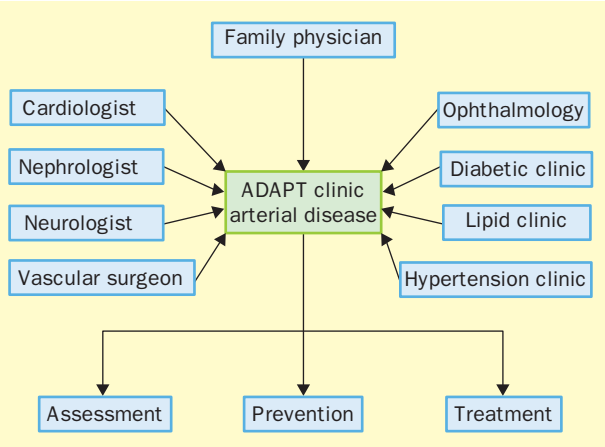

Figure 1: **Referral sources to ADAPT clinic**

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Investigations to determine cardiovascular risk and effect of risk factors on target-organ status

Risk-factor assessment

Lifestyle—family history, smoking, alcohol, salt intake, obesity (body-mass index), sedentary or active
Hypertension—conventional blood-pressure measurement, 24 h ambulatory blood-pressure measurement, exclusion of secondary hypertension*
Diabetes—urinalysis, fasting glucose, and insulin
Dyslipidaemia—fasting cholesterol, triglyceride, HDL and LDL fractions, lipoprotein-a
Hypothyroidism—thyroid function tests
Homocysteinaemia—homocysteine
Recurrent thrombosis—thrombophilia screen (including antibodies to phospholipid)

Target-organ assessment

Kidney—dipstick urinalysis, dipstick microalbumen, biochemistry (urea, creatinine, electrolytes, serum urate), haematology (haemoglobin, film, white cell count), isotope renography*, magnetic resonance scan of renal arteries*, renal angiography*
Heart—electrocardiography, echocardiography, stress electrocardiography*, coronary angiography*
Brain—carotid duplex scan, computed tomography scan*, magnetic resonance scan*, cerebral angiography*
Arterial organ—fundoscopy and fundal photography*, doppler studies, arterial tonometry and compliance, angiography (cerebral, renal, peripheral, carotid, coronary)*, biochemical assays (endothelial-cell function by urinary 2,3-dinor-6keto PGF_{1a}, platelet function by urinary 11 dehydro TXB_2, oxidant injury by urinary 8-epi PGF_{2a})

*Investigations done only when specifically indicated.

specialty through which the patient was referred in the hospital. To gain the acceptance of different specialties, it was imperative that the clinic was not seen to be interfering with the management of patients. The ADAPT clinic was proposed, therefore, as a clinical response to the increasing burden of arterial disease in a variety of specialties, such as: transient cerebral ischaemia and stroke in neurology; coronary heart disease, hypertension, and dyslipidaemia in cardiology; renal-artery stenosis in nephrology; aortic aneurysm, and peripheral-vascular and carotid-arterial disease in vascular surgery; ischaemic colitis in gastroenterology; hypertensive and diabetic retinopathy in ophthalmology; and diabetic vascular disease in endocrinology (figure 1).

The logical role for the ADAPT clinic was to provide a common strategy for all patients, irrespective of the target organs involved, that would complement the referral source and allow the patient to return to it for specialist treatment. These concepts were readily accepted by the cardiovascular division of he hospital in which the clinic was based.

The reality

The establishment of the ADAPT clinic was facilitated by the shared-care approach to outpatient management that had been used for the previous 5 years in the blood-pressure and lipid clinics. The principle of this approach is that referred patients are assessed initially by a nurse who inputs patients' details on to a database, arranges investigations and presents the consultant with all relevant data, which enables diagnostic and management decisions to be made at the first consultation. This feature of the ADAPT clinic has been incorporated into the nursing and secretarial staffing structure of the blood pressure unit, but as the clinic develops, and especially as the follow-up burden increases, dedicated staff will be appointed. A part-time doctor has been appointed to run the ADAPT clinic under the supervision of a consultant. The technical requirements for the cardiovascular assessment have been provided within the framework of the blood pressure unit but again, as referrals increase, dedicated staff (and equipment) may become necessary.

Patients referred to the ADAPT clinic are first interviewed by a nurse who enters the patient's name, address, age, sex, personal and family history, height, weight, body-mass index, and current blood pressure into the database (DABL97, version 7) designed specifically for the management of cardiovascular patients.[2] The nurse arranges various investigations (panel) that have pre-booked times, the results of which are entered on to the database before the patient sees the doctor.

The database incorporates a feature that permits classification of patients as high-risk, medium-risk, or low-risk according to risk factors, such as smoking, body-mass index, blood pressure, and lipids, and the presence or absence of target-organ damage or arterial disease.

Initially high-risk patients are selected for aggressive collaborative management. There are two goals in the treatment of high-risk patients: coordinated[3,4] and stringent modification[5,6] of identifiable risk factors, and prescription of drugs, such as statins and antiplatelet therapy, that may benefit the arterial organ[7,8] or improve haemostasis.[9,10] For risk modification, the familiar risk factors, such as smoking, obesity, excessive alcohol, dyslipidaemia, hypertension, and glucose intolerance, are addressed. To deal with these risk factors successfully in patients at high risk of cardiovascular disease, the goals of management should be set well within the limits of normal for age and sex.[11] Other potential risk factors, such as homocystine, fibrinogen, and lipoprotein-a, which as yet, are not generally accepted as deserving therapeutic intervention,[12] should, if identified, be corrected in these high-risk patients. For medication, drugs such as the statins should be used for their lipid-lowering properties and their potentially beneficial effects on the arterial-vessel wall.[8] Similarly, antithrombotic agents, such as aspirin and warfarin, should be used as indicated to influence the haemostatic balance towards fibrinolysis rather than thrombosis.[9,10]

Patients with high-risk cardiovascular disease and manifestations of arterial-organ involvement are currently being referred to the ADAPT clinic. The cardiovascular assessment is necessarily detailed and time consuming, but the cardiovascular profile generated is sufficiently comprehensive to allow critical appraisal of management

Characteristics	Patient A		Patient B	
	Visit 1	Visit 2	Visit 1	Visit 2
Blood pressure (mm Hg)				
Mean in office	197/124	160/102	200/114	165/104
Mean daytime	174/110	133/85	174/109	134/87
Mean night-time	151/99	102/65	155/94	113/70
Risk factor				
Age (years)	45	46	45	46
Smoking	20 cigarettes/day	None	40 cigarettes/day	20 cigarettes/day
Alcohol	40 units/week	15 units/week	42 units/week	40 units/week
Exercise	Sedentary	Exercise, walks	Sedentary	Sedentary
Weight (kg)	85·1	77·4	83·8	88·6
Body-mass index (kg/m^2)	31	28	29	30
Total cholesterol (mmol/L)	7·30	5·10	5·9	6·72
Risk factor indicator	High	Low	High	High

Blood-pressure and risk-factor profiles for two patients

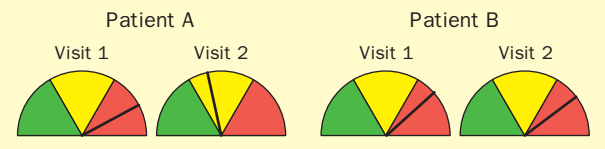

Figure 2: **Risk-factor-indicator changes for patients A and B**

and treatment strategies. An example of the ADAPT approach may be seen in patients A and B (table). Both patients were similar at initial assessment, with histories of ischaemic heart disease, family histories of cardiovascular disease in both parents, and similar risk factors and referral blood pressures (210/105 mm Hg and 180/115 mm Hg). During 4 months of risk-factor modification, antihypertensive treatment successfully decreased blood pressure in both patients; however, overall risk-factor modification was successful only in patient A, in whom cholesterol was decreased with pravastatin, whereas cholesterol increased in patient B. On the DABL, computed risk-factor indicators (figure 2), patient A's risk-factors were eventually decreased from the high-risk zone (red) to just within the low-risk zone (green), whereas for patient B the risk factor indicator increased within the red zone, which showed the need for more aggressive management.

The main goal of ADAPT is to create as favourable an environment for the cardiovascular system as possible with current knowledge. The ultimate objective of ADAPT is to provide all patients with arterial disease with a long-term strategy of prevention of further risks and the most scientific approach to treatment of their vascular disease with efficient management and treatment of the entire arterial organ to delay or prevent progression of the disease. An important secondary objective is to use existing and developing technology, such as tonometry and ultrasound to assess the entire arterial tree to identify areas that may be threatened by the atherosclerotic process.[13] We anticipate that cardiovascular research will soon provide therapeutic options that will require a more holistic approach to the management of cardiovascular disease.

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