

## The Role of Screening Blood Tests in Patients With Arterial Disease Attending Vascular Outpatients

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**Objective:** to evaluate the benefits of a policy of performing screening blood tests in new patients with arterial disease referred to the vascular outpatients department.

**Methods:** clinical audit over a 12-month period of all new referrals with arterial disease to the vascular outpatients department at the Leicester General Hospital.

**Results:** two hundred and seventy-two patients had at least one blood test performed at their outpatient visit. All of these patients had a full blood count performed, of which 21 results (21%) were abnormal. Further investigation of patients with abnormal results revealed one case of bladder cancer, one case of leukaemia and one patient with polycythaemia. Urea and electrolytes were measured in 269 patients (99%). Of these, 26 (10%) were expectedly abnormal in patients with known renal impairment. A further 27 patients (10%) were identified to have some degree of unrecognised renal impairment. Serum non-fasting glucose was measured in 252 patients (93%). There were 11 unexpectedly raised results, but further investigation of these patients only diagnosed one of these patients as diabetic. Serum cholesterol was measured in 201 patients (74%). One hundred and thirty-two patients (66%) had an abnormally raised serum cholesterol level. Of these, only 12 patients (6%) were known to have hyperlipidaemia.

**Conclusions:** screening new patients with arterial disease in vascular outpatients does identify significant abnormalities, in particular renal impairment and hyperlipidaemia. Correction of these abnormalities may reduce the morbidity associated with contrast induced nephrotoxic acute renal failure, and also contribute to secondary prevention of vascular events associated with raised lipids.

**Key Words:** Arterial disease, Hyperlipidaemia; Screening; Blood tests

### Introduction

The major risk factors for occlusive peripheral vascular disease are smoking, diabetes, hypertension and hyperlipidaemia. There is increasing evidence that modification of these risk factors may halt progression of disease and reduce the risk of cardiovascular death.<sup>1</sup> Thus, many patients attending vascular outpatient clinics undergo screening blood tests to identify and treat these risk factors. The aim of this study was to evaluate the benefits of a policy of performing screening blood tests in new arterial cases referred to the vascular outpatients department.

### Patients and Methods

Over a 12-month period between November 1995 and October 1996, 304 new patients with arterial disease

attended the vascular outpatient clinics at Leicester General Hospital. These included patients with occlusive arterial disease of the limbs, carotid artery disease and aortic aneurysms. The case notes were reviewed to identify 272 patients (89%) who had at least one of the following blood tests performed at their outpatient visit: full blood count, serum urea, creatinine and electrolytes, serum random blood glucose, serum lipids (total cholesterol and triglycerides) and plasma viscosity. The indications for referral and demographic data were collected for each patient together with the results of the blood tests. Abnormal results were divided into those expected to be abnormal and those not expected to be abnormal in order to determine whether a policy of screening all new arterial cases with routine blood tests was worthwhile. The normal range for these parameters reported at the Leicester General Hospital is illustrated in Table 1.

### Results

Two hundred and seventy-two patients (89%) had at least one blood test performed at their outpatient visit.

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**Table 1. Normal values for parameters measured.**

Test	
Haemoglobin	13.5–18 g/dl men 11.5–16.5 g/dl women
White cell count	4–11 × 10 <sup>9</sup> /l
Platelets	150–400 × 10 <sup>9</sup> /l
Sodium	133–144 mmol/l
Potassium	3.3–5.3 mmol/l
Urea	2.5–6.5 mmol/l
Creatinine	45–130 µmol/l
Glucose	4–6 mmol/l
Plasma viscosity	1.5–1.72 centipoise
Cholesterol	3.9–6.5 mmol/l
Triglycerides	<2 mmol/l

Although the hospital reference range for cholesterol is 3.9–6.5, the desirable serum cholesterol in accordance with The British Heart Foundation and The National Cholesterol Education Programme in the U.S.A. is <5.2 mmol/l

**Table 2. Indication for referral of patients to the vascular outpatients. Figures in parentheses are percentages.**

Indication	Number of patients
Suspected occlusive disease (upper and lower limb)	200 (73.5)
Suspected aortic aneurysm	36 (13.2)
Other aneurysms	6 (2.2)
Carotid artery disease	25 (9.1)
Others	5 (1.8)

**Table 3. Number of patients undergoing each blood test (n = 272). Figures in parentheses are percentages.**

Blood test	Number of patients screened
Full blood count	272 (100)
Urea and electrolytes	268 (99)
Blood glucose	252 (93)
Lipids	201 (74)
Plasma viscosity	170 (63)

There were 179 males (66%) with a median age of 69 (range 34–91) and 93 (34%) females with a median age of 73 (range 46–88). The indications of these 272 patients is shown in Table 2. The number of patients who underwent each investigation is shown in Table 3.

All patients underwent a full blood count (n = 272). The result was normal in 251 patients (92%). Of the 21 abnormal full blood counts (8%), 14 were expected

to be abnormal. Three patients were already under investigation for iron deficiency anaemia, nine patients with normocytic anaemia had end stage renal failure and two had a combination of infection and general debility.

Seven patients (2.5%) had unexpectedly abnormal results: one had a bladder cancer, another was diagnosed with leukaemia and a final patient was diagnosed with polycythaemia. No cause for anaemia was found in the other four patients after investigation.

Urea and electrolytes were measured in 269 patients (99%) and 55 (20%) were abnormal. Of these, 26 (10%) were expected to be abnormal in patients with known chronic renal failure or impairment and were referred to the vascular outpatients by the regional renal unit or medical colleagues. Twenty-nine (11%) were unexpectedly abnormal. In two of these patients the abnormality was hypokalaemia induced by diuretics. The remaining 27 patients were found to have varying degrees of renal impairment.

Serum glucose (non-fasting) was performed in 252 patients (93%) and 46 (18%) were abnormal. In 35 of these patients abnormal results were expected. The remaining patients were investigated with a glucose tolerance test and only one patient was found to be a newly diagnosed diabetic.

Plasma viscosity was performed on 170 patients (63%). It was mildly raised in 32 patients and moderately raised in a further 10 patients.

Serum lipids (total cholesterol and triglycerides) were performed in 201 patients (74%). One hundred and thirty-two (66%) had a raised serum total cholesterol (>5.2 mmol/l). Of these, 12 (6%) were known to have hyperlipidaemia and were being treated with a combination of dietary manipulation and/or lipid lowering agents. One hundred and twenty (60%) had unexpectedly abnormal serum cholesterol. Eighteen of these patients were known to be diabetic.

The total cost of performing these screening blood tests was £2222.99. The data illustrated in Table 6 shows that screening for hypercholesterolaemia is the most cost effective of these tests.

Overall, 201 patients had a full blood count, plasma urea and electrolytes, plasma glucose and serum lipids

**Table 4. Value of the screening policy.**

Blood test	Number screened	Number of abnormal results	Number of abnormal results that were unexpected	Percentage of abnormal results that were unexpected
Full blood count	272	21	7	33
Urea and Electrolytes	269	55	29	53
Glucose	252	46	11	24
Cholesterol	201	132	120	91

Table 5. Current cost of screening policy.

Test	Cost per test	Number of tests done in 1 year	Cost per year	Amount spent per unexpectedly abnormal result
Full blood count	£2 81	272	£764 32	£109 18
Urea and Electrolyte	£2 55	269	£685 95	£23 65
Glucose	£0 64	252	£161 28	£14 60
Plasma viscosity	£2 84	170	£428.80	£48 20
Cholesterol	£0 64	201	£128 64	£1.07

performed. Only 51 of these patients had a full set of normal results.

### Discussion

The conservative management of peripheral vascular disease in the legs was summarised in five words by Housley: "Stop smoking and keep walking".<sup>2</sup> Other important conservative measures include control of ischaemic heart disease, hypertension, diabetes mellitus and hyperlipidaemia.<sup>1</sup> The role of aspirin in secondary prevention of atherosclerotic disease is now established.<sup>3</sup>

There is increasing evidence that hyperlipidaemia is an important and treatable risk factor for the progression of atherosclerotic disease. Recent guidelines from the American College of Physicians suggest that all patients with known coronary artery disease, stroke, intermittent claudication or any other atherosclerotic disease process should be screened and treated for hypercholesterolaemia.<sup>4</sup> Treatment of hypercholesterolaemia in patients with atherosclerosis decreases disease progression and reduces complication rates making it cost-effective in the long-term.<sup>5</sup>

The extent to which clinicians should routinely perform screening blood tests in an elderly population with many risk factors is unclear. This paper examined the value of screening blood tests in new arterial referrals to a vascular clinic. Despite the relatively low number of abnormal full blood counts, this data illustrates that some important abnormalities will be determined by performing this test. Some abnormal results are to be expected in the elderly population. In addition, full blood count measurement may be very useful in the management of vascular disease as relative anaemia will contribute to poor peripheral perfusion and may exacerbate symptoms of peripheral vascular disease.

Identification of patients with pre-existing renal impairment is very important because it may be reversible and thus prevents symptoms of lethargy, debility and progression to end stage renal failure. In addition,

many patients will undergo further investigation with contrast angiography which may precipitate contrast induced (nephrotoxic) acute renal failure in patients with pre-existing renal impairment. A baseline creatinine of <130  $\mu\text{mol}$  per litre is considered a safe level and usually does not lead to acute renal failure after angiography.<sup>6</sup> Early identification of patients with renal impairment allows the opportunity to correct factors contributing to renal impairment, namely discontinuing nephrotoxic medication, correcting obstructive uropathy and initiating investigation and treatment for renal artery stenosis. Patients with pre-existing renal impairment should be prepared for angiography with prehydration using isotonic crystalloid. Renal protection with renal dose dopamine or mannitol has also been shown to decrease the incidence of renal failure following contrast angiography.<sup>6</sup>

Screening for diabetes mellitus with serum glucose only revealed one new patient among 252 patients screened. This data suggests that routine determination of plasma non-fasting glucose in new referrals to the vascular clinic has limited value, and urinalysis of blood glucose test strips may be a cheaper alternative. Plasma viscosity is a non-specific marker of inflammation; this test provided little useful clinical information and seems inappropriate.

This data demonstrates that serum random cholesterol determination is a most useful blood test in patients with vascular disease. A large number of patients (132 out of 201 screened) had serum cholesterol levels above the desirable level of 5.2 mmol/l set by the National Cholesterol Education Programme in the U.S.A. and The British Heart Foundation in the U.K.<sup>7</sup>

The current evidence suggests that secondary complications of the atherosclerotic process, including cardiac and cerebrovascular events, are responsible for the lower long-term survival rates of patients following major vascular surgery compared to age and sex matched populations.<sup>8-10</sup> Correction of lipid abnormalities might prevent this.

Non-fasting serum total cholesterol is a reliable screening test for the detection of hyperlipidaemia.<sup>7,11</sup>

The data suggests that there is a significant incidence of unrecognised and untreated hyperlipidaemia in patients presenting to the vascular clinic.

In conclusion, the number of abnormal results of common blood tests was low and especially the rate of unexpected abnormalities was minimal. The exceptions were, however, the renal tests and the serum lipids. Correction of these abnormalities may reduce the morbidity associated with contrast induced nephrotoxic acute renal failure, and also contribute to secondary prevention of vascular events associated with raised lipids.

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