

CEREBRO-VASCULAR DISEASE EDUCATION **RESOURCE PACK # 4 AN OVER-VIEW OF** **STROKE AND STROKE PREVENTION**

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Strokes- A Summary

'Stroke' is the third most common cause of death (after coronary heart disease and cancer). About 100,000 people have a stroke each year in Britain and there are about 50000 stroke-related deaths; many survivors suffer severe disability. Stroke incidence has been declining, at least since the 1950s; reliable data before that date are not available.

The major risk factors for stroke are hypertension, heart disease, peripheral vascular disease, and diabetes. The mortality from stroke in North America decreased by 25 percent between 1969 and 1979, probably due to improved control of hypertension. Ischaemic stroke is often due to emboli from atherosclerotic large cerebral arteries; 20 percent are due to cardiac emboli, 15 percent to occlusion of small cerebral arteries, and 30 percent of unknown origin. Half of all strokes are in patients with no risk factors. The family physician's main contribution to stroke prevention is through the detection and management of hypertension, the prescription of anticoagulants for patients with atrial fibrillation, and the early diagnosis and treatment of transient Ischaemic attacks (TIAs). Aspirin reduces the risk of stroke in patients with TIA's or peripheral vascular disease. Patients with non-valvular atrial fibrillation have an overall stroke risk of 5 percent per year. The risk increases with increasing age, valvular or coronary disease, recent TIA or stroke, hypertension, diabetes, or congestive heart failure. In patients under the age of sixty with no risk factors other than atrial fibrillation, the risk is 1 percent per year. Moderate-dose warfarin reduces the risk of stroke from 4.5 percent to 1.6 percent per year with a small risk of bleeding. Patients of any age with atrial fibrillation and additional risk factors or those over sixty-five with atrial fibrillation alone, should receive warfarin. Those who are unable to take warfarin should receive aspirin (Hirsh, 1995).

Carotid endarterectomy provides significant protection against further ipsi-lateral stroke for patients with high-grade (>70 percent) symptomatic stenosis, TIA, amaurosis fugax, or small completed stroke ipsilateral to the carotid narrowing). This is now the recommended treatment for this degree of stenosis (Moore et al., 1995). Trials of surgery for lesser degrees of stenosis are in progress.

The evidence does not support carotid endarterectomy for symptomless stenosis. Medically treated asymptomatic stenosis carries a low risk of stroke (2 percent per year) compared with symptomatic high grade stenosis (>10 percent per year). One trial has reported significant benefits from surgery but only with patients, surgeons, and hospitals highly selected for low surgical risk, (May-berg and Winn, 1995). Routine screening by auscultation of the neck for carotid bruits or by ultrasound is not recommended. Carotid bruits are insensitive and non-specific markers for carotid stenosis. Doppler ultrasound has a sensitivity of 87 to 89 percent and a specificity of 92 to 97 percent. Carotid angiography, however, carries a stroke risk of about 1 percent.

Carotid stenosis is an indication of general vascular disease and is associated with a fourfold increase in the risk of coronary heart disease. Patients with stenosis should therefore receive a full assessment of risk factors, with appropriate measures for risk reduction.

The major underlying pathological process in the aetiology of stroke is the formation of atheroma within the walls of the cerebral arteries, Atheromatous plaques narrow the lumen of the arteries while the overlying endothelial lining may, become ulcerated, stimulating thrombosis or the formation of emboli, which will subsequently lodge in

smaller vessels of the brain. The areas within the vessels that are particularly prone to atheroma formation are those where there is greater turbulence: at the origin of the great vessels on the aortic arch, the bifurcation of the common carotids and, within the circle of Willis, at the points of division within the middle cerebral arteries.

The formation of atheroma is accelerated in the presence of systemic Hypertension and diabetes mellitus. Hypertension is a well-recognised risk factor in the incidence of stroke, causing not only cerebral infarction, but also haemorrhage. It is associated not only with atheroma but with the formation and rupture of micro-aneurysms on vessels deep within the brain substance. Atheroma is a generalised phenomenon, affecting blood vessels throughout the body, including the coronary arteries. A stroke may follow the development of a myocardial infarction, due to coronary artery atheroma, having been caused by embolisation from a mural thrombus that formed overlying the infarcted tissue. There are numerous other sources of emboli that may arise within the heart, e.g. a thrombus in the left atrium due to atrial fibrillation and mitral stenosis or emboli from diseased heart valves themselves.

As well as hypertension being implicated, any episode of hypotension may equally cause cerebral infarction, whether following a myocardial infarct, Pulmonary embolus or gastrointestinal bleed, because of failure of the autoregulatory mechanisms to maintain cerebral perfusion. Elderly people are very susceptible to potent antihypertensive therapy, so that hypotension may be produced and itself induce a stroke, rather than the original hypertension being treated. Rarer causes of stroke include conditions where arteritis occurs or where the viscosity of blood is increased from excess circulating cells or proteins.

Prevention of Stroke

The control of hypertension in all age groups is well-established as a means of reducing the incidence of stroke. Prevention of polycythaemia in susceptible subjects by repeated venesection will improve blood viscosity, as will treatment of other haematological disorders associated with an increased blood viscosity.

Anticoagulation after a cerebral embolus (especially in patients with mitral stenosis and atrial fibrillation) is a reasonable treatment option, although there is controversy about the timing of such treatment-whether to start immediately or after an interval of one to two weeks, in order to decrease the risk of haemorrhage within the infarct. Platelet aggregation is now thought to contribute to arterial thrombosis and hence to embolism, ischaemia and infarction, particularly in the cerebral circulation. Platelet aggregation and embolization are thought to arise at sites of atherosclerotic damage within the circulation. In the presence of atherosclerotic disease within the external carotid arteries and intracranial vessels, drugs that prevent platelet aggregation may reduce the incidence of stroke. Controlled trials have demonstrated that aspirin, having powerful in vitro antiplatelet properties, has a small beneficial effect in the prevention of further cerebral damage in patients who have already had strokes or transient ischaemic attacks.

Table to show the Common Cause of Stroke

Stroke is caused by a vascular event which results in loss of perfusion. Basically, there are three types of such vascular event: thrombosis, embolism, and haemorrhage. Thrombosis and embolism result in infarction. Haemorrhage may be

Causes of Stroke	
Conditions affecting blood vessels-producing vessel occlusion or platelet emboli	Atheroma (hypertension diabetes mellitus) Arteritis (polyarteritis nodosa systemic lupus arteritis syphilis)
Haemodynamic disturbances	Hypertension Hypotension (e.g. after myocardial infarct pulmonary embolus, gastrointestinal haemorrhage)
Sources of emboli within the heart	Atrial fibrillation, atrial myxoma, Mural thrombus after myocardial infarction Prosthetic cardiac valves Endocarditis (rheumatic heart disease, bacterial endocarditis)
Conditions altering blood constituents	Hyperviscosity syndromes affecting plasma proteins
Drugs	E.g. Anti-hypertensive agents.

intra-cerebral or subarachnoid.

Risk factors for stroke

The Risk Factors of Cerebrovascular Disease

The risk factors for stroke and the strength of the causal relationship is shown in the Table.

Risk factors for stroke	Strength of causal association
Increasing age	++++
Hypertension	++++
Male sex	+++
Existing vascular disease	+++
Cardiac dysfunction	+++
Diabetes	+++
Smoking	++
Alcohol intake	++
High lipids	++
High fibrinogen	+
High haematocrit	+
Geography	+
Family history	+
Obesity	+

Age and sex

The Royal College of physicians report on stroke showed that the incidence of strokes increased rapidly over the age of 55, so in those aged 85 and over it was 40 per 1000, (Fig. 15.15), although in the Oxford Community Stroke Study, it was only 20 per 1000 in this age group. Stroke is more common in men than in women, though the sex difference is much less marked than for coronary heart disease, the rate in men being rather less than twice that in women.

Hypertension

Apart from age, the outstandingly important risk factor for stroke is high blood pressure. A number of epidemiological studies have demonstrated clear relationships between both systolic and diastolic blood pressure and stroke incidence.

Many randomised trials have also demonstrated that lowering blood pressure reduces stroke incidence, both in middle age and in the elderly (at least up to the age of 80 years). The effect of treatment on risk reduction in those with mild hypertension (phase V diastolic 90-109 mm hg) in the 35-64 year age-group is illustrated as follows;

The number of patients to be treated for five years to prevent one stroke, according to entry diastolic pressure and age. (MRC trial data, from Miall and Greenberg 1988)

Age in years	Entry DBP	
	< 100 mm Hg,	100- 109 mm Hg
35-44		500
45-54	400	118
55-64	286	57
35-64	500	95

To what extent the decline in stroke deaths this century is due to detection and treatment of hypertension is debatable, though it is thought such treatment probably accounts for a minority of the reduction.

Heart disease

Heart disease is associated with an increase risk of stroke, and atrial fibrillation carries a particularly high relative risk (and is present in a subs proportion of stroke patients, particularly the elderly).

Ischaemic heart disease, sino-atrial disease, valvular disease (in prosthetic valves), bacterial endocarditis, and cardiac failure all in stroke risk.

Conversely, stroke survivors are more likely to die of coronary heart disease than a further stroke.

Smoking

Although smoking is now an acknowledged risk factor for stroke. the relationship is less important than is the case with coronary heart disease or peripheral arterial disease. Meta-analysis of 32 studies of smoking and stroke suggests an overall relative risk associated with smoking of about 1.5, but ranging from about 3 for those under 55 years to 1.1 for those over 75 years. The relative risks for different types of stroke were: cerebral infarction 1.9, cerebral haemorrhage 0.7, and subarachnoid haemorrhage 2.9.

Lipids

Although the relationship between elevated blood lipids and coronary heart disease is well established, the effect on stroke is less clear. But most studies show a positive relationship between raised lipids and cerebrovascular disease. Data from the MRFIT trial showed a positive relationship between raised serum cholesterol and risk of death from non-haemorrhagic stroke, but an inverse relationship with haemorrhagic stroke (which is, however, rarer).

Obesity

Obesity is related to hypertension, impaired glucose tolerance, and elevated blood lipids; because of these relationships, it is therefore associated with increased stroke risk. But there is no clear evidence that it is an independent risk factor, though waist: hip ratio may be a positive factor.

Alcohol

As with lipids, the relationship between alcohol consumption and stroke is not clear; but there is good evidence that heavy drinking is associated with increased stroke risk and that moderate alcohol consumption may also adversely influence stroke risk, especially that of subarachnoid haemorrhage. High alcohol consumption is associated with hypertension so, is with obesity, some at least of the increased risk is not independent.

Diabetes

Overall, diabetes approximately doubles the risk of stroke and, with the increasing incidence of diabetes in the elderly, the contribution of this disease to stroke in this age group is important.

Blood viscosity, haematocrit and fibrinogen.

The effect of these on cerebral blood flow is undoubtedly important, but evidence relating elevations to increased stroke risk is debatable.

Transient ischaemic attacks

An important risk factor for stroke is a previous transient ischaemic attack and in hospital-based studies up to a third of strokes have been preceded by one of these. There is evidence that anti-platelet treatment with low dose aspirin can reduce the risk of subsequent stroke in such patients.

Carotid artery disease

In the absence of trial evidence that carotid endarterectomy is beneficial in reducing stroke risk, there is no good case for screening for carotid artery disease, as a risk factor for stroke, by auscultation of the carotid arteries.

Practical Suggestions for Practice Based Initiatives for Stroke Prevention;

1).Practice Based Strategic Programme

Each practice to set up a database of patients known to suffer from cerebrovascular disease plus a database of patients at risk; overlapping with existing PCG initiatives based on a programme addressing NSF targets for coronary heart disease.

This would concentrate on risk factor recording, and relate to local clinical governance activities. The initial suggested step would for the practice to meet to discuss the possibility of setting up a strategic programme for stroke prevention for their own patients. Examples of initiatives that might be adopted may include the following;

- Development of a Disease Index of patients who are known to suffer from cerebrovascular disease.
- Development of a Stroke Risk patient index containing the names of patients are at high risk of suffering from a stroke.

- Development of a local protocol for the practice to follow in order to identify at risk and stroke patients.
- Development of a local protocol for the practice to follow in order to promote primary prevention through opportunistic and targeted screening.
- Development of a local protocol for the practice to follow in order to manage a programme of secondary prevention for those patients who were on the stroke register.

2). Opportunistic Screening of the General Population; (Primary Prevention)

This should consist of the following:

Enquiry about cardiovascular disease and deaths in first degree relatives, especially a an early age (<50 years men, <55 years women),

Enquiry about a personal history of cardiovascular disease or diabetes.

Measurement of blood pressure and careful assessment if this is raised.

Measurement of weight and height, calculation of body mass index.

Enquiry about smoking habit and appropriate advice.

Enquiry about diet and alcohol consumption, with appropriate advice.

Measurement of random total serum cholesterol selectively in those at high risk because of other factors.

Measurement of blood sugar in those seriously obese.

The aim should be to achieve at least one risk factor assessment in every adult patient every five years. Ideally, the age-group 20-65- years should be targeted but if this prospect seems overwhelming, start with the 35-65 year age-group, or even just those aged 40-60 years.

3). Management of Risk Factors in Patients on Stroke Register; (Secondary Prevention)

Blood pressure

- Those with sustained levels at, or above, 180/100 justify active management and consideration of drug treatment.
- Those with a level of 160/90 or less should be reviewed five yearly.
- Those with blood pressures between these levels should be reviewed annually

Weight

Those with a body mass index greater than 25 require dietary advice and supervision.

Smoking

Those who are smokers should be given simple verbal and written advice and offered support.

Cholesterol

Although the aim is to achieve cholesterol levels below 5.2 mmol/l, dietary advice should be focused particularly on those with levels above 6.5 mmol/l and on those with other risk factors. Those with levels above 7.8 mmol/l warrant consideration of drug treatment as well as dietary advice, especially where there are other risk factors.

Transient Ischaemic attacks and Minor Strokes

A transient ischaemic attack (TIA) is a sudden focal disturbance lasting less than 24 hours. Minor strokes last over 24 hours but carry the same prognostic significance as TIAs. The risk of stroke following either is 11% in year and then 5% per year.

Investigation is urgent in the case of minor strokes where scanning is needed to distinguish minor ischaemia from haemorrhagic stroke. This must be done within 2 weeks of the event. Differentiate from the history between:

- (a) vertebrobasilar attacks, characterised by homonymous hemianopia, bilateral transient blindness, diplopia, or bilateral motor or sensory loss.
 - (b) Carotid artery attacks, characterised by dysphasia, or visual loss in one eye only. Aspirin 300 mg daily should be given to all unless contraindicated. This will reduce the subsequent incidence of stroke by 25%. One possible contra-indication is a patient with a minor stroke has not had a haemorrhage excluded by CT scan.
- Risk Factors. Treat as for stroke.

Summary

- The important risk factors for coronary heart disease, family history, premature CHD, hyperlipidaemia, hypertension, and cigarette smoking.
- Lowering blood cholesterol, hypertension treatment, and stopping smoking reduce CHD risk.
- Risk factors interact and a multiple risk factor approach to prevention is therefore important.
- Opportunistic screening in primary care can achieve risk factor measurement but management of risk factors must be an essential sequel to this.
- The risk factors for stroke are the same as those for CHD but hypertension is especially important and heart disease is an important risk factor for stroke.

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