Prognosis, outcome and recurrence of stroke

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Abstract

Defining prognosis may be helpful in planning acute treatment of stroke, setting rehabilitation goals and setting resource priorities. Case fatality is 12% within the first seven days of a first-ever stroke. Late deaths are usually due to the consequences of immobilisation and stroke recurrence. Long-term outcome is difficult to predict but older age, significant pre-stroke co-morbidity and severe stroke are generally associated with poor physical recovery. Stroke patients have a risk of recurrence 15 times that of an age- and sex-matched population. Stroke type may influence recurrence. Early stroke recurrence may be prevented by antiplatelet drugs. Patients in atrial fibrillation and with recently symptomatic high-grade carotid stenosis are at particular risk of stroke.

Key words: stroke, stroke recurrence, prognosis, outcome, dependency, risk factors.
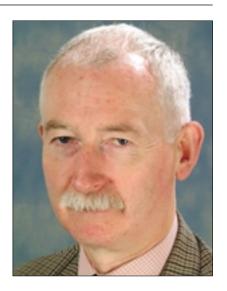
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Introduction

Completed stroke remains a major cause of morbidity and disability predominantly, though not exclusively, affecting the elderly population. The prognosis following acute stroke remains poor: a third of those affected are dead and a high proportion remain disabled at one year. Measures aimed at the prevention of recurrent stroke are still only effective in a minority, though careful risk stratification has allowed better targeting or resources.

Prognosis and outcome

Defining prognosis may be of assistance in planning acute treatment, setting rehabilitation goals, advising carers and, on a larger scale, setting resource priorities. Attempts to give a prognosis apply to individuals whereas natural history applies to populations. The evidence base for prognosis is deficient in most areas[1] but useful information is available from the Oxford Community Stroke Project (OCSP) for the UK population and also from more recent work from the community studies in south London, in which there was a greater proportion of non-Caucasian ethnic groupings.

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Case fatality

Case fatality is generally accepted to be 12% within the first seven days and 19% at one month for first-ever stroke. Patients with primary or subarachnoid cerebral haemorrhage and those with total anterior circulation infarcts are at highest risk of death. Some patients die within hours as a result of the ischaemic insult or cardiac complications, others succumb at between five and 10 days to the effects of cerebral oedema. Late deaths are usually due to the consequences of immobilisation and early or delayed stroke recurrence, especially in patients with subarachnoid haemorrhage, in whom the risk of death from re-bleeding is as high as 30%. Patients with brain stem involvement, caused either by the primary ischaemic process or by compression due to raised intracranial pressure, are at high risk of death. The risk of death falls after the first 30 days to about 9% per annum, twice that for the population at large.

Dependency

Dependency depends largely on the type of stroke. Those with total anterior circulation syndromes have the highest risk of dependency in survivors; by contrast, in those with lacunar syndromes about 10% will remain disabled and require significant help from others. The proportion of patients with residual disability falls with time; improvement over many months can be expected after stroke. Whether there is a genuine exponential

improvement is uncertain since many of the tools used to measure improvement are relatively insensitive to change at the upper end of performance.

Long-term outcome is difficult to predict but, in general, older age, significant pre-stroke co-morbidity and severe stroke (for example, a large infarct volume with impaired consciousness and urinary incontinence) are associated with poor physical recovery. However, prediction may fail to take into account the risks associated with recurrent stroke, especially if using the mathematical model derived from the OCSP, which was validated on independent cohorts of patients with stroke, to give an estimate of prognosis for individual patients.[2] As part of the routine investigation of people with stroke, enquiry should therefore be made of their demography and risk factors for vascular disease, and also their pre-stroke functioning and social details. Their level of impairment at presentation and after 24 hours should be measured and used to define the origin of their syndrome, the site and type of stroke, its cause and prognosis.

The use of multimodal imaging to predict outcome is in its infancy but may identify patients who might benefit from interventions, including the administration of thrombolytic drugs.[3]

Stroke recurrence

Stroke recurrence has been divided, on the basis of recent clinical trials, into early (within two weeks) and delayed (often beyond three months) recurrence. Regardless of cause, the risk of stroke recurrence is highest early after first-ever stroke and delay minimises the benefit of any intervention. About 2–3% of patients have recurrent stroke within the first 30 days after stroke, 9% in the first six months and 10–16% in the first year. That is, stroke patients have a risk 15 times that of an age- and sex-matched population. Thereafter the risk becomes lower and is about nine times that of the general population.

In most patients the second stroke will have the same aetiology as the first, an assumption on which most preventive measures are predicted. Generally, transient ischaemic attack (TIA) carries a similar risk of stroke. Factors suggesting that an individual may be at greater risk include age, male gender, previous cardiovascular disease, diabetes, haemorrhagic stroke, high blood pressure, cardiac co-morbidity – including cardiac failure and atrial fibrillation – and high-grade carotid stenosis. Stroke type may influence recurrence in that posterior circulation ischaemia has a higher rate of recurrence than lacunar stroke, partial anterior circulation stroke or total anterior circulation stroke. Mathematical models to predict future events are available but have not been validated on external populations.[4]

In general, it is possible to adopt two different approaches to prevention of stroke recurrence. The first approach states that small changes in the health of the population at large, such as lowering blood pressure by reducing salt content in food or cessation of smoking, can have reasonably large effects on stroke. An alternative strategy is to target members of the population who are at high risk of stroke and offer them appropriate treatments.

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Key messages

- Patients with primary or subarachnoid cerebral haemorrhage and those with total anterior circulation infarcts are at highest risk of death

- Dependency depends largely on the type of stroke

- Factors suggesting a greater risk of recurrence include male gender, age, diabetes, haemorrhagic stroke, high blood pressure and cardiac co-morbidity

- The use of heparin in acute stroke cannot be recommended

- Measures to reduce the risk of vascular events should be employed in all stroke patients

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Early stroke recurrence

Prevention of early stroke recurrence has been achieved with the use of antiplatelet drugs given as 300 mg aspirin daily for the first 14 days after stroke. For every 1,000 patients treated there is an excess of 11 patients free of death and disability at six months, but one patient affected by cerebral haemorrhage. This effect is largely achieved by preventing early stroke recurrence. Whilst it is possible that heparin achieves a similar effect, any benefit is offset by intracranial haemorrhage and the use of heparin in acute stroke cannot be recommended. Patients with stroke due to atrial fibrillation benefit equally and are not disadvantaged by the use of aspirin compared with heparin.[5]

Late stroke recurrence

Measures to reduce the risk of vascular events, including reduction in blood pressure and cholesterol according to the Royal College of Physicians Guidelines on the management of stroke, should be employed in all stroke patients.[6] Since writing this paper two important studies have reported – PROGRESS and the Heart Protection Study.* All patients should be treated with antiplatelet drugs, other than those requiring long-term anticoagulants in a dose of 75 mg daily.[7] There is limited evidence that the addition of dipyridamole to aspirin may be more effective than aspirin alone and a further trial is underway to confirm this.[8] Clopidogrel alone has a similar effect to that of aspirin on recurrent stroke and the addition of clopidogrel to aspirin is currently being tested against clopidogrel alone in high-risk patients.

Patients at particular risk of stroke are those in atrial fibrillation and those with recently symptomatic high-grade carotid

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* The PROGRESS Study has shown that antihypertensive therapy, using a combination of the ACE inhibitor, perindopril, and the diuretic, indapamide, can prevent stroke recurrence even in patients without high blood pressure (*Lancet* 2001;**358**:1033-41). After four years' follow-up, stroke recurrence was reduced by 28% in the drug-treated group compared to placebo. The Heart Protection Study has shown that simvastatin can reduce the risk of ischaemic stroke by 27% in patients at high risk of coronary heart disease (*Br J Cardiol* 2002;**9**:16-21).

stenosis. Those in atrial fibrillation have a 12% risk of second stroke and this can be reduced to 4% by the use of anticoagulants, keeping the INR between 2.5 and 4.0. Older patients and those with cardiac co-morbidity as well as previous stroke are at highest risk and stand to gain more than other patients with atrial fibrillation. Any benefit should be offset against the risk of brain and other haemorrhage and therefore meticulous patient selection and INR control are required.

Warfarin should not be used in patients without atrial fibrillation since there is a significant excess risk of brain haemorrhage, especially in those of older age, with leuko-araiosis on brain CT. Nor should it be used in and those in whom anticoagulant control is poor.

Patients with recently symptomatic high-grade carotid stenosis benefit most from carotid endarterectomy. Careful selection of high-risk patients and low risk of post-operative complications should mean that the number needed to treat to prevent one stroke is only three to six. A guide to the appropriateness of carotid endarterectomy may be found at the website given in reference 4.

Whilst some interventions are of relatively low effectiveness, meticulous attention to diagnostic detail, the application of general risk factor modification and careful case selection for high-risk interventions will all have a small but significant effect on stroke recurrence.

Editors' note

This is the seventh article in our stroke series. Previous articles have included:

- Cerebrovascular disease (editorial) (*Br J Cardiol* 2001;**8**:482).
- The epidemiology of stroke (*Br J Cardiol* 2001;**8**:507-13).
- The pathophysiology of stroke (*Br J Cardiol* 2001;**8**:586-9).
- Acute management of stroke (*Br J Cardiol* 2001;**8**:654-7).
- Prevention of vascular disease following acute ischaemic stroke (*Br J Cardiol* 2001;**8**:704-11).
- Stroke rehabilitation (*Br J Cardiol* 2002;**9**:23-30).

Further reading

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