Aftermath of stroke: an epidemiological study in Melbourne, Australia

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SUMMARY  A population-based study of the incidence of stroke was carried out in an urban area of Melbourne, Australia. The 508 cases were followed up and the survivors interviewed briefly at three months and in more depth six months after the onset of stroke. Fifty-eight per cent of all subjects had survived to six months, and the strongest prognostic indicator was level of consciousness at time of maximum impairment. By six months, 25% of all cases were independent in self-care and mobile outside the home; of those patients aged under 75 years, suffering a first stroke and retaining full consciousness at the time of maximum impairment, the proportion was 50%. A very imperfect correlation was present between residual physical impairment and return to the full range of prestroke activities.

Cerebrovascular disease is the third most frequent cause of death in Australia, but many patients survive an acute attack in a state of physical, psychological, and social disadvantage. On a community basis, the costs of the long-term support of these survivors far outweigh those incurred in the acute state of the disease.

To assess individual risk and to estimate the resources needed by a community we carried out a population-based epidemiological study. Physical impairment and functional disability were assessed in survivors to six months, and an attempt was made to estimate the disadvantage or handicap experienced by such survivors.

Methods

The definition of stroke was that used by the World Health Organisation: “rapidly developed clinical signs of focal (or global) disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than vascular.” Transient ischaemic episodes are thus excluded, as are subdural and extradural haematomas. Apart from 10 cases diagnosed at a coroner’s necropsy, each case was diagnosed by a medical practitioner. Because one-third of the patients were not admitted to a major hospital, and thus not subjected to full diagnostic work-up, distinctions made between cerebral haemorrhage and infarction were regarded as unreliable. In this report the generic term “stroke” has been used to cover all cases, including those with subarachnoid haemorrhage.

From March 1978 to September 1979, we carried out a population-based study of the incidence of stroke in a defined urban area of Melbourne, Australia. The population at risk was 160 000 (Australian census, 1976). Methods of case ascertainment included fortnightly visits to all general practitioners, weekly visits to all public hospitals serving the area, and less frequent visits to all small hospitals and nursing homes. A daily computer printout was available detailing all ambulance calls within the area; regular liaison was maintained with the coroner’s office. It is believed that case ascertainment was virtually complete.

At the time of acute onset each patient, or relative where more appropriate, was interviewed by a trained nurse who followed up the course of the patient through the early weeks. Level of consciousness was defined as fully conscious, unconscious and not responding to painful stimuli (comatose), and “semi-coma” for those patients not falling into either of these categories. The information was taken from hospital admission records, clarified where necessary with nursing notes, by direct observation when possible, and by asking the general practitioner in those cases not admitted to hospital. At three months after onset, survivors were located and interviewed briefly; at six months a long, structured interview was carried out by the medical social worker. No cases were lost to follow-up; one patient who had moved to Perth was interviewed by a member of the department of medicine, University of West Australia, and full case-notes were received from the doctor treating a patient who had returned.

123
to his native Italy. At six months, physical impairment and functional disability were not determined by neurological examination, but rather by careful observation coupled with the patients' complaints. Self-care capacity was assessed using the scale of activities of daily living (ADL) devised by Katz and colleagues; questions were asked about occupation and leisure, with particular interest in change. Further information was sought about support, both by family and community, adaptations in the home, and the present state of medical care.

The multiple logistic regression was carried out using the statistical package for the social sciences on the University of Melbourne cyber.

Results

The incidence of stroke in this population has been reported. Of the 508 patients, 296 (58%) were still alive at six months. The overall survival curve (fig 1) showed the customary pattern of high early mortality, stabilising within weeks, and then falling more-slowly. Survival rates are shown by age and sex in table 1; under the age of 75 there was no significant difference between the sexes, or between the age groups. Over age 75, the women in this series had a substantially worse prognosis (p < 0.001); the probability of surviving to six months decreased with age (p < 0.05), but the major contributor to the higher mortality was the group of older women.

A better prognostic indicator than age or sex is the level of consciousness of the stroke victim at the time of maximum impairment. In the present series 77% of those fully conscious were alive six months later as compared with 46% of those described as drowsy or in a semi-coma and 17% of those reported as comatose. The combined effect on survival at six

![Survival curves to six months in 508 patients after suffering stroke.](http://jech.bmj.com/)

### Table 1 Survival rates to six months in 508 patients with stroke, classified by age and sex

<table>
<thead>
<tr>
<th>Age</th>
<th>25-54</th>
<th>55-64</th>
<th>65-74</th>
<th>75 and over</th>
<th>All ages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Men</td>
<td>69 (18/26)</td>
<td>64 (34/53)</td>
<td>66 (63/96)</td>
<td>63 (44/70)</td>
<td>65 (159/245)</td>
</tr>
<tr>
<td>Women</td>
<td>62 (10/16)</td>
<td>59 (16/27)</td>
<td>62 (44/71)</td>
<td>45 (67/149)</td>
<td>52 (137/263)</td>
</tr>
<tr>
<td></td>
<td>67 (28/42)</td>
<td>62 (50/80)</td>
<td>64 (107/167)</td>
<td>51 (111/219)</td>
<td>58 (296/508)</td>
</tr>
</tbody>
</table>

### Table 2 Survival and disability at six months after onset of stroke in all cases; those aged under 75, fully conscious at time of onset, and experiencing a first stroke; and the remainder

<table>
<thead>
<tr>
<th></th>
<th>All cases (n = 508)</th>
<th>Aged 75 or under, 1st stroke, fully conscious (n = 151)</th>
<th>Remainder (n = 357)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Alive and Live in private residence</td>
<td>296 (58)</td>
<td>120 (79)</td>
<td>176 (49)</td>
</tr>
<tr>
<td>Independent in all ADL</td>
<td>218 (43)</td>
<td>105 (70)</td>
<td>113 (32)</td>
</tr>
<tr>
<td>(a) Walk unrestricted distance ± stick</td>
<td>140 (28)</td>
<td>86 (54)</td>
<td>58 (16)</td>
</tr>
<tr>
<td>(b) Walk &gt; 100 m and &lt; 1 km ± stick</td>
<td>68 (25)</td>
<td>42 (30)</td>
<td>26 (14)</td>
</tr>
<tr>
<td>Drive own car or use public transport, or both, unaccompanied</td>
<td>57 (23)</td>
<td>33 (30)</td>
<td>24 (14)</td>
</tr>
<tr>
<td></td>
<td>85 (17)</td>
<td>54 (36)</td>
<td>31 (9)</td>
</tr>
</tbody>
</table>
months of three prognostic indicators — age, level of consciousness, and first stroke — was examined by a multiple logistic regression. These indicators accounted for 70% of the variance.

In table 2 an attempt has been made to analyse the quality of life of survivors at six months in terms of their functional disability. A comparison was made between those subjects who were aged 75 years or under, had suffered a first stroke, and retained full consciousness, and the remaining subjects. Seventy per cent of the former group were living at home compared with 32% of the others.

A more desirable state is to be not only living at home, but also to be fully independent in all the self-care functions of the activities of daily living (ADL). Of those with a good prognosis, 54% could be so categorised but only 16% of the others. Independent mobility outside the home had been achieved by 50% as compared with 14%; 36% of the good prognosis group were able to use public transport unaccompanied, or drive a car, compared with 9% of the remaining patients.

Whether an individual, unable to carry out the usual self-care activities, is able to live at home is likely to depend more on the availability of support within the home than on the patient’s neurological state. In table 3 all survivors to six months living at home have been classified by their dependence or independence in activities of daily living. Of the former group, 85% needed help from another member of the family for at least one aspect of self-care or general support. Half were visited regularly by the district nurse and 22% had paid or council help in the home. As Opti has commented, home care is not a cheap option.

Physical impairment, such as a residual weakness, is the most obvious and visible long-term effect of stroke. In fig 2 the 85 survivors living independent lives (table 2) have been classified by their main prestroke life activity. Three mutually exclusive categories were considered — those employed gainfully before the stroke, those describing themselves as housewives not otherwise employed, and those fitting neither category: in the latter group, principally older people, how they used their leisure time was regarded as their main activity. Each category was subclassified by the presence or absence of residual weakness or communication difficulty, and in fig 2 the heights of the columns indicate the proportion in which the main life-time activity was essentially unchanged. As would be expected, within each group those without residual impairment were more likely to have returned to their previous activity; the difference is much less than one might have envisaged. Residual weakness or difficulty in communication after stroke is neither a necessary, nor sufficient, cause of disadvantage or handicap.

**Discussion**

The widely differing prognosis of cerebral infarction and haemorrhage have been well documented, yet equally well established is the value of careful observation of consciousness during the acute phase. Analysis of the present series has shown that observations on level of consciousness, age, and whether or not the stroke was recurrent are capable of “predicting” medium-term survival to about 70% accuracy. Inclusion of the results of a full neurological workup has been shown to increase the power of prediction only to 85%.

A rule of thumb, commonly quoted in reference to the outcome of stroke, is that of “thirds.” One-third die, one-third remain chairfast or bedfast, and one-third regain reasonable function. When all cases

Table 3 Support received from members of family, district nurse, or home help by 218 patients with stroke who have survived to six months, living at home

<table>
<thead>
<tr>
<th>Family</th>
<th>District nurse</th>
<th>Home help</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADL independent</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>ADL dependent</td>
<td>66 (85)</td>
<td>39 (50)</td>
<td>17 (22)</td>
</tr>
<tr>
<td>All alive at 6/12 and in private residence</td>
<td>114 (52)</td>
<td>45 (21)</td>
<td>26 (12)</td>
</tr>
</tbody>
</table>

ADL = Activities of daily living.

Fig 2 Percentage of survivors, living independent lives six months after stroke, whose main prestroke activity was unchanged.
of stroke are considered, the results of the present study do not differ greatly from this rough guide; at six months the mortality was 42%, and 25% had returned to reasonable function defined as mobility outside the home. At six months, in those patients aged 75 or under, experiencing a first stroke, and retaining consciousness, the mortality was 20% and 50% were mobile outside the home.

In considering disability there has been a relatively recent change in emphasis from describing functions, as exemplified by activities of daily living, towards consideration of residual disadvantage or handicap. Handicap, essentially the view a person or society takes of a particular disability, has always been imperfectly correlated with physical deficit. In the present study the observation that people with evident residual impairment have returned to an active and busy life accords with clinical experience; the converse is also, unfortunately, too common. This is a difficult, important, and little understood area of rehabilitation. Sadka uses the overall term "motivation" but in recovery from stroke, as in life generally, the presence of motivation can be only partly intrinsic to the nature of the individual. Perhaps of greater importance are the social and psychological factors that condition response to rehabilitation; it is likely that early counselling, and treatment where appropriate, is as important to a return to prestroke function as are the physical aspects of rehabilitation.

This study was made possible by the very able field-work of sisters Val Case, Kim Coleman, and Nancy Stott, together with the medical social workers Mrs D Weigall and Miss Jan Rudd.

References

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