Summarizing our findings we noted that after the follow-up period (median 53 months) half of the patients were fully independent in ADL. One-fifth of all patients could return to work, one-fifth required assistance, one-fifth had died, and one-tenth was disabled.

The patients' condition at the acute stage was of prime importance in the early prognosis and the functional recovery in our series as in previous studies. A retrospective study of 769 patients. Acta Neurol Scand 45 (Suppl 138) 1970

Numerous studies have dealt with long-term survival, and 78% for five years' survival. Subsequent strokes were twice
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The patients' condition at the acute stage was of prime importance in the early prognosis and the functional recovery in our series as in previous studies. A retrospective study of 769 patients. Acta Neurol Scand 45 (Suppl 138) 1970

It is well known that cigarette smoking is a risk factor of cerebrovascular disease. In the present series it could also be shown that prognosis and functional recovery were better in nonsmokers than in smokers. Hypertension, again, was of no prognostic value.

It is also well known that patients with cerebrovascular disease often die due to coronary heart disease. This was noted in our series where equal numbers of deaths were due to cerebrovascular and coronary heart diseases. This supports the concept of universal atherosclerosis as a basic etiology in ICA occlusion.

References

Prognosis of Patients With Middle Cerebral Artery Occlusion
MARKKU KASTE, M.D., AND OLLI WALTIMO, M.D.

SUMMARY The long-term prognosis of 78 stroke patients with occlusion of the middle cerebral artery (MCA) or its branches is described. The mean age of the patients was 44 years. The mortality rate in the acute phase was 5%. The acute and total mortality rates of men were higher than those of women (p < 0.05). Life-table analysis gave 94% probability for one year's survival, 84% for three years' survival, and 78% for five years' survival. Subsequent strokes were twice as common as cardiovascular events as the cause of death. Seventy-two percent of the survivors became fully independent in activities of daily living (ADL), 27% required assistance, 1% was totally disabled, and 43% returned to work. Left-sided occlusion was overrepresented in those who died (p < 0.001) and those who returned to work (p < 0.05), and right-sided occlusion was overrepresented in those who required assistance in ADL (p < 0.05).

Introduction
Numerous studies have dealt with long-term prognosis of stroke and various types of stroke, while little attention has been paid to the clinical entity of occlusion of one major cerebral artery. It would be desirable in clinical routine work to know the stroke patient's long-term prognosis evaluated on this basis, since this type of stroke is frequently encountered. Therefore, we have analyzed the long-term prognosis of stroke patients with occlusion of the middle cerebral artery (MCA) or its branches.

Patients and Methods
From the 1966 to 1973 files of the Department of Neurology, University of Helsinki (Finland), 83 patients with ischemic brain infarction and occlusion of the MCA or its branches, verified angiographically or by autopsy, were found. Etiological causes other than ischemic were excluded

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by all relevant methods which included neuroradiology,
EEG studies, brain scans, CSF examination, etc. Transient
ischemic attacks (TIA) were excluded by accepting only
those patients with symptoms and signs which had lasted
longer than 24 hours.

The majority of patients had symptoms and signs of uni-
lateral motor and/or sensory disturbances associated with
ipsilateral facial paresis, visual field defects, and dysphasia
or aphasia if the dominant hemisphere was involved.

In December, 1973, a questionnaire was mailed to the
patients. They were asked about their working capacity and
independence in the activities of daily living (ADL) before
and after the stroke. Death certificates and autopsy records,
if any, also were studied. Five patients could not be traced
and had to be omitted from the analysis. For statistical
analysis of the data, the Chi-square method and Student's t-
test were used.

The age and sex distributions of the patients in this study
are shown in table 1. The mean follow-up time was 30.3
months (range: 0 to 102 months).

Results

During the follow-up period, 11 patients had died (two
women and nine men). The causes of death are shown in
table 2. It is seen that subsequent strokes were a cause of
death twice as often as cardiovascular disease.

Only four male patients (5%) died in the acute stage of
stroke. The case-fatality rate for men was higher than for
women during the acute stage (p < 0.05), and the total mor-

tality rate for men was higher than for women during the
follow-up period (p < 0.05).

The mean age of those who died was 60 years, which does
not differ significantly from the mean of the entire series (44
years).

A life-table analysis of the data gives a 94% probability of
surviving the first year, 84% the third year, and 78% the fifth
year after stroke.

Oclusion of the MCA occurred on the left side in 53
patients and on the right side in 25 patients, the difference
being highly significant (p < 0.001). Of the 53 patients, 21
had MCA occlusion and 32 had occlusion of the MCA
branches on the left side, while of 25 patients, two had MCA
occlusion and 23 had occlusion of the MCA branches on
the right side; the difference was highly significant (p < 0.005).

Localization of occlusion according to sex is shown in

<table>
<thead>
<tr>
<th>Table 3 Location of MCA Occlusion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Left</strong></td>
</tr>
<tr>
<td><strong>Branch occlusion</strong></td>
</tr>
<tr>
<td>Men</td>
</tr>
<tr>
<td>Women</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

Numbers in parentheses are percent.

ADL

<table>
<thead>
<tr>
<th>Fully independent</th>
<th>Requiring assistance</th>
<th>Totally dependent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>28 (67)*</td>
<td>14 (33)</td>
<td>42</td>
</tr>
<tr>
<td>Women</td>
<td>25 (78)</td>
<td>6 (19)</td>
<td>1 (3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>53 (72)</td>
<td>20 (27)</td>
<td>1 (3)</td>
</tr>
</tbody>
</table>

*Numbers in parentheses are percent.
(p < 0.05). There was no statistically significant difference in the distribution of occlusion of the MCA or its branches between those who were able to return to work and those who were not.

Localization of MCA occlusions in relation to ADL is shown in table 7. Occlusions of the right MCA were more common among those who required assistance in ADL than among those who were fully independent (p < 0.05). Left MCA occlusions were more common among those fully independent than among those requiring assistance in ADL (p < 0.05).

**Discussion**

Although this type of stroke is not uncommon, very little attention has been paid to the functional recovery and long-term prognosis of occlusion of the MCA or its branches.

The patients of the present series had either occlusion of the MCA or its branches which was verified by angiography or autopsy. In considering the results we obtained, one should reflect on our method of selecting patients: all patients with ischemic brain infarction admitted to our hospital are not treated in the Department of Neurology; quite often, and especially when they are elderly, they are treated by the Departments of Medicine. There is also the selection of those patients referred from other hospitals: elderly and seriously ill patients are preferentially treated in the hospital of primary admission. Furthermore, all stroke patients in the Department of Neurology are not examined by angiography; an elderly patient showing signs of universal arteriosclerosis often escapes angiographical examination because of the risk of complications. This is why the mean age is only 44 years in the present series; however, it is almost identical with previous series.

The mortality rate (5%) in the acute stage is low compared with earlier hospital series reporting case fatalities of non-embolic and/or embolic brain infarction in the acute phase between 10% and 35%. This most likely was due to the fact that in this series the patients were quite young and all had occlusion of the MCA which supplies only part of one hemisphere; there was no severe brain edema, which in severe stroke is the main reason for patient deaths.

All those patients who died in the acute phase of stroke were men; their mean age was slightly higher than that of the entire series. In general, according to the literature, the risk of early fatality from stroke increases with age. Almost as universally, the prognosis has been shown to be independent of sex. However, some authors have found a slightly higher case fatality of men in most age groups. In other series, the poor prognosis of women has been explained by their increased mean age. In the present series, the mean age of the men was slightly higher than that of the women. The probability of survival in the present series (78% after five years) seems to be better than that in earlier studies with their five-year survival rates between 38% and 66%. This difference may be explained by the selective factors mentioned in which the most severely ill and elderly patients were underrepresented.

The causes of death in the present series are similar to those in most earlier studies: subsequent strokes were twice as common as cardiovascular disease.

Functional recovery was excellent in our series; 72% of the patients who survived the acute phase of stroke became fully independent in ADL, while 27% required assistance in ADL, and only one (1%) was totally disabled. In earlier studies the percentages of independent patients varied between 40% and 63%. In some studies the percentage of survivors with a good recovery has been particularly low, i.e., 12% to 17%. It is difficult to draw any solid conclusion from the heterogenous literature. However, the reason for better functional recovery in this series is believed to be that the patients were relatively young and had occlusion of only the MCA or its branches. The significance of age also is evident in the mean ages of the different ADL groups: the patients who became fully independent were younger on the average than those who required assistance in ADL.

In the present series 43% of the survivors regained their working capacity, which agrees with earlier studies reporting figures from 30% to 40%, 9, 12, 20. The mean age of the patients who were able to return to work was 38 years. Younger patients are more likely to regain their working capacity since they are better able to compensate for the lost function of the infarcted regions of the brain.

Left-sided occlusion of the MCA was more common among those who were able to return to work (p < 0.05), and right-sided occlusion among those who required assistance in ADL (p < 0.05). Marquardt suggested the
Cerebral Infarction in the Mongolian Gerbil
Exacerbated by Phenoxybenzamine Treatment

C. Patrick McGraw, Ph.D.,*† Annette G. Pashayan, A.B.,* and O. T. Wendel, Ph.D.*

SUMMARY In a double-blind study, the effects of a large dose (20 mg per kilogram) and a small dose (2 mg per kilogram) of phenoxybenzamine (PBZ) on cerebral infarction were evaluated in 120 Mongolian gerbils. The left common carotid artery was ligated in 100 animals; a sham operation was done in 20 animals. One hour later, 25 animals were given 2 mg per kilogram of PBZ, 25 animals were given 20 mg per kilogram of phenoxybenzamine, and ten were given 0.5 cc of normal saline on the same treatment schedule. Morbidity and mortality were recorded for one week and then all surviving animals were killed. All brains were studied for signs of infarction. Of the saline-treated animals, 32% had cerebral infarction and 81% of these died. Of the animals treated with phenoxybenzamine, 36% of those receiving 2 mg per kilogram and 68% (p < 0.05) of those receiving 20 mg per kilogram had cerebral infarction and all of those with infarction died during the observation period. The animals receiving phenoxybenzamine had a larger stroke index than those treated with saline. The authors concluded that phenoxybenzamine is harmful in postischemic treatment of strokes.

WHEN ISCHEMIA develops after brain or spinal cord trauma or hemorrhage, monoamine neurotransmitters may leak from neurons that have lost their structural integrity as a result of that ischemia.¹ ² These neurotransmitters have been postulated to alter nerve cell metabolism, depress neuronal function, produce cerebral edema,³ ⁴ cause cerebral arterial vasospasm⁵ ⁶ ⁷ ⁸ ⁹ ¹⁰ and increase platelet aggregation.¹¹ ¹² Mechanisms that normally inactivate these neurotransmitters, namely presynaptic re-uptake and oxidative deamination, are attenuated due to the lack of oxygen, and the accumulation of these substances in the extracellular space exacerbates the damage caused by the initial ischemia.¹ ² ⁷ This information suggests several approaches to the pharmacological therapy of stroke: (1) inhibition of neurotransmitter synthesis, (2) suppression of the release of neuro-

References


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