

Stroke before Fifty

Experiences from a Five-year Study

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ABSTRACT

Thirty-seven patients below the age of 50, with an acute first-time cerebrovascular lesion have been studied. Some form of predisposing factor was present in nearly all cases. There was a remarkably high incidence of cardiovascular and cerebrovascular disease among the parents of the stroke victims. Only 50% of the patients with hypertension known prior to the stroke had received adequate treatment. There were six females on oral contraceptives. The immediate mortality, i.e. within one month, was 35% essentially caused by a very high initial mortality among patients with cerebral haemorrhage. The patients were checked after 30 months. At this time, 16 patients were still alive and 11 able to perform some sort of work. Among the survivors there was a high incidence of diabetes and impaired glucose metabolism, to judge from intravenous glucose tolerance tests. The chances of survival and vocational rehabilitation seem to be fairly good, compared with higher age groups, thus urgently calling upon the resources of the community for active therapeutic measures and training. Individuals with hypertension and impaired glucose tolerance, with heredity for vascular disease and diabetes seem to be especially at risk for early stroke. Health surveys should be directed to tracing these subjects early.

INTRODUCTION

In four previous papers (5, 6, 7, 8) the epidemiology and prognosis for patients with first-time cerebrovascular stroke below the age of 70 has been discussed. The papers were based upon a study covering the years 1967-71 in the county of Uppsala. During these years 37 patients under the age of 50 suffered from a cerebrovascular stroke. Although this patient group is small compared with the others, the young patients constitute not only the usual socio-medical problem but stroke at this age as a rule also means a catastrophe for family and immediate dependants. Therefore, it is of great importance to study these patients by looking for predisposing factors, prognosis, and of course possibilities for prevention and rehabilitation. The pre-

sent paper reports the observations on the 37 patients mentioned above.

MATERIAL AND METHODS

In accordance with the WHO (16) recommendations, stroke has been defined as a sudden onset of focal neurological deficit due to a local disturbance of blood supply to the brain. Further, it has been required that the stroke shall lead to death or sequelae persistent for more than 48 hours. Thus transitory ischemic attacks (TIA) have not been included nor have subarachnoidal haemorrhages or stroke recurrences.

The diagnosis of cerebral haemorrhage has been based upon autopsy, cerebral angiography, lumbar puncture and/or a clinical history strongly suggestive of haemorrhage. Cerebral embolism was diagnosed from a suggestive clinical history and a probable source of emboli. The major part of the material was classified as cerebral infarction in the absence of a rapid onset or a heart disorder causing embolisation. With these criteria, hospital records from the actual time period were sought covering all in-patients in the county of Uppsala.

Information was gathered about age, sex, marital status, education, social group (1), type of profession. Form of living: alone or not alone. Hereditary factors: whether the father or mother had had a stroke or myocardial infarction. Previous medical history was registered with special reference to ischemic heart disease or cardiac arrhythmia, intermittent claudication, hypertension and diabetes mellitus. The principles for the evaluation of previous treatment suggested by Hood et al. were used (11). Active adequate treatment thus would mean a diastolic blood pressure kept at 100 mmHg or at least, full doses of two drugs. Other previous or current diseases were registered, as was the consumption of various drugs. In the females, special interest was given to the use of oral contraceptives. Any previous symptoms suggesting cerebral vascular disease such as TIA and vertigo were looked for.

The clinical status on admission was assessed by means of a score system, suggested by Mathew et al. (14) and modified by Frithz & Werner (7) (Fig. 1). Information were gathered about laboratory data, which were usually obtained by autoanalyser. In most cases ECG recordings

FACTOR	Score
Mentation	
Level of consciousness:	
Fully conscious	8
Somnolent	6
Precomatose	4
Comatose	0
Orientation:	
Oriented×3	6
Oriented×2	4
Oriented×1	2
Disoriented	0
Speech:	
Normal	23
Disconnected phrases	15
Expressive or impressive aphasia	10
Dumb	0
Cranial nerves	
No conjugate deviation	6
Conjugate deviation	0
Central facial function	
Intact	3
Palsy	0
Motor strength (each limb separately)	
Normal strength	5
Paresis	2
Paralysis	0
Performance disability status scale	
Normal	28
Moderate impairment	21
Considerable impairment	14
Severe impairment	7
No performance at all	0
Reflexes	
Normal	3
Spastic	1
No reflexes	0
Sensation	
Normal	3
Mild sensory abnormality	2
Severe sensory abnormality	1
No response to pain	0
	100

Fig. 1. Neurological evaluation of patients with acute stroke (modified after Mathew)

were made with a 12-channel direct ink-writer. As described earlier (7) the ECGs were classified as either normal or pathological.

The duration of the hospitalization and the form of discharge (home or to an institution) were noted. If the patient had died, the autopsy record was checked. Those patients surviving were followed to the end of 1973 by

Table I. Distribution according to diagnosis, sex and age

	Age, years			Total
	49-40	39-30	29-	
Number of deaths within parentheses				
Cerebral haemorrhage				
♂	5 (4)	3 (2)	0	8 (6)
♀	5 (4)	1	0	6 (4)
Total	10 (8)	4 (2)	0	14 (10)
Cerebral infarction				
♂	7 (1)	1	1	9 (1)
♀	6 (1)	4 (1)	2	12 (2)
Total	13 (2)	5 (1)	3	21 (3)
Cerebral emboli				
♂	2	0	0	2
♀	0	0	0	0
Total	2	0	0	2

means of hospital records and the Public Office Register. Through the Public Office Register, information about deaths among the patients under observation was obtained continuously. When a patient was dead, hospital records, autopsy records and death certificates were checked.

The surviving patients were admitted to the hospital for a follow-up examination on average 30 months after discharge from hospital. The follow-up examination included a detailed medical history, rehabilitation measures and other forms of support from the community. Any other disease of importance was noted. The clinical examination included a detailed neurological status. The degree of handicap was assessed and classified in the following three grades according to Fällström (9): moderate physical handicap, considerable physical handicap, and severe handicap. The blood pressure was registered under standardized conditions. The laboratory analyses included determination of haematocrit, RBC, WBC, ESR, electrolytes, uric acid, cholesterol and triglycerides.

An intravenous glucose tolerance test (IVGTT) was also performed. The glucose tolerance was expressed as a *k*-value calculated from the formula

$$K = \frac{e \log 2 \times 100}{T/2}$$

RESULTS

A total of 37 patients below the age of 50 were found during the observation time. One male patient suffering from cerebral haemorrhage was found in the Coroners records. The distribution according to the diagnosis is shown in Table I. In the same table the immediate mortality, i.e. within one month, is also shown. It is seen that most of the fatal cases are in

Table II. Complicating conditions

	Cerebral haemorrhage	Cerebral infarction	Cerebral embolism
No history	2	0	0
Haemorrhagic complications (dicumarol)	1	0	0
Non-haemorrhagic complications (hypertension, diabetes, SLE, rheumatoid arthritis, hyperlipoproteinemia, uremia, arteriosclerotic heart disease, valvular heart disease, oral contraceptives)	11	19	2
No complicating disease	0	0	2

the haemorrhage group. In Table II are shown the coexistence of complicating disease. In the whole material, there were only 4 cases where no predisposing factor were noted. The incidence of known hypertension was 50% among the haemorrhages and 25% among the infarctions (Table III). Of the patients with known hypertension, only 40% had been on a therapy that could be considered good. In the remaining cases the therapy was inadequate or non-existent. One patient with haemorrhage was on treatment with dicumarol after a myocardial infarction. The incidence of diabetes is about the same for both cerebral infarction and haemorrhage, 14%. Prodromes suggestive of cerebrovascular disease were noted in as many as 20% of the cases in both groups. In Table IV the hereditary pattern for the patients is shown. Heredity is considered as strongly positive when both parents are known to have had cardio- or cerebrovascular disease and positive when one of the parents had. The percentage figures given are calculated on the whole groups. In some cases anamnestic informa-

Table III. Analysis of antihypertensive treatment and symptoms prior to the cerebrovascular lesion

	Cerebral haemorrhage	Cerebral infarction
No anamneses	2	0
Known hypertension no treatment	2	1
treatment dropped or inadequate	2	2
treatment adequate	3	2
Prodromes	3	6

Table IV. Heredity for vascular diseases among the patients with cerebral haemorrhage and cerebral infarction compared with a control population

	One parent (%)	Both parents (%)
<i>Myocardial infarction</i>		
Among parents of the stroke victims	49	13
Among parents of controls	22.5	2.0
<i>Cerebral vascular lesion</i>		
Among parents of the stroke victims	43	17
Among parents of controls	25.0	2.0

tion about heredity was lacking. Only in 2 cases was there a complete lack of history. This low percentage can be explained by the fact that most records are from a university clinic, where special attention has been given to such matters.

It is of special interest that among the cerebral infarctions there were 6 women taking oral contraceptives. Two of them died. The duration of pill ingestion varied from 5 weeks to 2 years before the stroke.

The neurological status, assessed with the score system is shown in Table V. The immediate prognosis is well correlated to the scores, a low score indicates fatal outcome.

The long-term prognosis is demonstrated in Table VI, where the causes of death are also given. Eight patients died during the observation time, 4 of them as a direct consequence of the stroke, three from complicating diseases and one in a recurrence. Only 6 were without any physical handicap but 11 were able to work in some form (Table VII).

The results of the intravenous glucose tolerance test are shown in Table VIII. Four patients with overt diabetes have been excluded. This distribu-

Table V. Immediate prognosis in relation to the scores

Number of deaths within one month within brackets. One patient dead before admission to hospital has been omitted.

Score	0-14	15-24	25-
Number of patients	8 (8)	5 (3)	23 (1)

Table VI. *Survival of patients until follow-up, and causes of death**Causes of death:*

Direct consequence of the stroke, 4; Recurrence, 1; Cardiac decompensation, 1; Uremia, 1; Myocardial infarction, 1

	Dis- charged	Alive at follow-up
Cerebral haemorrhage		
♂	2	1
♀	2	1
Cerebral infarction		
♂	8	6
♀	10	7
Cerebral embolism		
♂	2	1
♀	0	0

tion of the *k*-values is compared with that within a Swedish population of similar age (15).

DISCUSSION

The young stroke victims contribute a comparatively small group. The limited number of cases in the present study does not permit extensive statistical calculations, but certain conclusions can be drawn.

It is obvious, for example, that practically all the patients represent a "bad selection". The clinical findings showed that the majority of the patients suffered from some form of complicating disease. In 2 cases only, it is known for sure that there was no apparent predisposing factor.

Hypertension was found to be present in about half of the patients suffering from cerebral

Table VII. *Degree of handicap and socio-medical status at follow-up*

	At work	Disablement pension
Cerebral haemorrhage		
Moderate handicap	1	1
Cerebral infarction		
0 handicap	5	0
Moderate handicap	4	0
Considerable handicap	0	1
Severe handicap	0	3
Cerebral embolism		
0 handicap	1	0
	11	5

Table VIII. *Distribution of k-values on intravenous glucose tolerance test*

Four patients with overt diabetes have been excluded

K-values	≤0.90		0.91-1.09		≥1.10	
	n	%	n	%	n	%
Number of patients	3	19	2	13	7	68
Percentage in control material	4		10		86	

haemorrhage and in a quarter of those with cerebral infarction. The latter figure is somewhat lower than the corresponding one for patients between 50-60 in the same population reported earlier (6). On the other hand the present investigation confirms our earlier observation that only about half the patients with hypertension have received adequate treatment. The same impression has also been reported by Ericsson (3), Hood et al. (11) and Frithz (5, 6), for example.

The overrepresentation of diabetes mellitus agrees with figures published earlier (6, 11).

The hereditary pattern is striking, with an overrepresentation of vascular diseases among the parents, compared with the findings from a health survey of 50-year-old men in the same county (10). A genetic factor predisposing to cerebrovascular stroke has also been suggested by Larsson (12). Recently, Friman & Waern (4) have demonstrated an overrepresentation of hypertension among relatives of persons with hypertension. It seems reasonable to assume that disposition to hypertension may be the main genetic factor responsible for the hereditary pattern.

The immediate prognosis as well as the long-term prognosis seems to be slightly but significantly better than in the higher age groups. The immediate mortality depends mostly of the type of lesion, as cerebral haemorrhage has a very ominous prognosis, while most patients with cerebral infarction survive the acute phase. There is also a direct correlation between the score and immediate prognosis (Table V). On the other hand, the coexistence of hypertension or other predisposing factors such as diabetes and a history of previous TIA have no significant influence either upon the immediate or long-term prognosis. Concerning previous hypertension earlier works by Marshall & Shaw (13) and Wyle (17) have shown a worse prognosis in patients with such a history. The present finding

may be due to the small number of patients. Another possibility is that after a manifest stroke, the patients with hypertension have been subject to more vigorous treatment. Active antihypertensive treatment seems to improve the prognosis, as recently shown by Beevers et al. (2). The number of surviving patients is small, but some of the laboratory findings at the follow-up are worth mentioning.

There is a strikingly high incidence of impaired glucose metabolism to judge from the number of cases with overt diabetes or pathological or borderline IVGTT. This further shows the role of diabetes in the stroke-prone profile. It is worth noting too, that the 4 females on oral contraceptives, and who survived, all had a normal IVGTT.

Concerning the vocational rehabilitation, the chances of going back to work after surviving a stroke seem to be fairly good compared with the higher age groups (8). The main obstacle to rehabilitation in this age group seems to be the presence of complicating psychiatric conditions. Psychiatric symptoms, such as emotional incontinence, emotional instability or irascibility, indicates a poor prognosis for rehabilitation, even if the physical handicap is slight or moderate.

From our findings some important conclusions can be drawn. First, the role of hypertension in the development of a cerebrovascular stroke in younger ages is quite obvious. Further, even known hypertension is not adequately treated in about half of the cases. Thus, health surveys, aiming at the detection of latent hypertension is motivated also in younger ages, but an adequate and vigorous follow-up of the findings is necessary if the health survey is not to be an end in itself.

Second, as hereditary factors seem to be important, screening of the relatives of patients with hypertension or other vascular diseases can be of value. The combination of hypertension and diabetes mellitus in the family history, in particular, calls strongly for continuous medical controls already in early middle age.

Third, the prognosis for vocational rehabilitation is relatively favourable. This should give these patients a high priority in the disposition of limited rehabilitative resources.

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