

## SPONTANEOUS SUBARACHNOID HEMORRHAGE

### *Prognostic Factors for Social Readjustment*

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**ABSTRACT.** Sixty-seven patients surviving spontaneous subarachnoid haemorrhage (SAH) have been followed up for 2-12 years (mean: 7 years) in order to determine prognostic factors concerning the long-term disability in familial and social functioning. A correlation was found between the severity of the neurological deficit at the time of admission and the degree of familial and social disability at the end of the observation period. In addition, the Barthel-Index on discharge was shown to be of prognostic value for readjustment for social—but not for familial—functioning. Other clinical variables in the acute stage, however, including source of bleeding, sex, age, interval between SAH and admission, level of consciousness, cognitive functions, as well as initial Hunt and Hess grading and Glasgow Coma Scale scoring, did not influence the long-term social prognosis. Furthermore, residual neurological signs, cognitive dysfunctions, and the Glasgow Outcome score on discharge were not related to the extent of social handicap in the long-term outcome. At the end of the observation period, significant correlations were found between the presence of persisting neurological and cognitive deficits but also disability in ADL functions and occupational capacity and the decline in familial and social functioning.

*Key words:* cerebrovascular disease, subarachnoid hemorrhage, disability, prognosis, readjustment.

A major contribution to stroke outcome research is the finding that stroke survivors suffer not only from purely physical, but also from psychic (ex depression) and social impairment. This knowledge has helped health- and human service providers to deal more appropriate with the entire spectrum of needs of stroke survivors (15, 16). Feigenson (14) has argued that along with medical treatment and rehabilitation the patient's quality of life has to be taken into consideration. There is, however, scant knowledge about the quality of life in the long-term outcome after SAH. It is likely that a considerable part of this group does permanently suffer from physical, cognitive, or

emotional disabilities. There are reports that only 30 to 46% of patients after SAH are completely recovering, and 25 to 75% suffer from emotional or psychological disturbances in daily living (6, 20, 31, 39, 40, 43). About 30% showed mild demential syndromes (11). Concerning the occupational status, only 40 to 70% of the survivors remained totally unaffected, 20 to 25% demonstrated a reduced working capacity at follow-up, and about 10% considered themselves completely unable to work (6, 19, 20, 39). 20 to 40% of the patients after SAH of unknown as well as aneurysmal etiology complained of persisting headache and fatigue (10, 11, 31). The different results are certainly due to variations in sample selection and follow-up time. Due to these findings, the familial and social readjustment after SAH is an important goal of rehabilitation.

The present study deals with the long-term familial and social disability after SAH. The aim of this retrospective investigation was to define the prognostic value of various clinical criteria in the acute stage as well as on discharge with regard to the long-term social readjustment.

## PATIENTS AND METHODS

### *1. Population*

The study is based on 72 nonselected patients suffering from spontaneous subarachnoid hemorrhage, consecutively admitted to our Department of Neurology. The population did not include the most severely impaired patients who often were admitted to the Department of Neurosurgery directly. The diagnosis was confirmed by computed tomography (CT), four-vessel cerebral angiography, and CSF examinations. If angiography failed to reveal the source of the SAH, four-vessel angiography was repeated after an interval of four to six weeks. Three (3) patients died preoperatively and 2 postoperatively, thus, 67 (35 male, 32 female) survivors remained for this study.

SAH was in no case caused by recent head injury, blood dyscrasias, intracranial neoplasms, arteritis, or anticoagulants. None of the patients had a history of previous neuro-

Table I. Vascular malformations in 26 patients, local distribution

Arteries	No. of patients
Anterior communicating artery aneurysm	12
Middle cerebral artery aneurysm	3
Internal carotid artery aneurysm	3
Posterior communicating artery aneurysm	3
Vertebro-basilar system aneurysm	1
A-V malformations	4

surgical intervention, tuberculosis or other systemic infectious disease.

In 41 (61%) of the 67 patients, no bleeding source could be identified angiographically. Table I shows the local distribution of the vascular malformations in the remaining 26 patients. In all 26 patients, operations were performed within one week after the initial bleeding.

The mean age at admission was 46.4 (SD 14.5, range 16–72) years. Regarding the source of bleeding, there were no differences in age (mean age 47.3 (SD 13.6) years in the group with SAH of unknown etiology; mean age 45.1 (SD 16.0) years in the group with SAH due to vascular malformation).

The routine management included absolute bed rest, analgesics, sedation, and control of blood pressure. Antihypertensive treatment was given when necessary. Neither antifibrinolytics, steroids nor calcium channel blockers were administered. The duration of follow-up ranged from 25–145 months (mean 85.4, SD 36.1). At the time of follow-up evaluation 65 patients were still alive while two had died.

## 2. Variables with possible influence on familial and social reintegration

A. The following variables at the time of admission were analyzed: source of the SAH revealed (yes/no); gender; age at admission; interval between SAH and admission; and clinical criteria.

Regarding the level of consciousness, focal neurological signs, and organic mental syndrome on time of admission, the patients were classified into two groups: patients with and without impairment. The organic mental syndrome was assessed using the criteria proposed by Berner (7, 8).

In addition, two widely adopted clinical rating scales were used: patients were categorized according to the grading of Hunt & Hess (21) and by means of the Glasgow Coma Scale (25).

B. Overall outcome on discharge from the clinic was assessed according to the Glasgow Outcome Scale (24). The Barthel Index (33) was used with respect to the independence in activities of daily living (ADL)-functions. The presence of absence of residual focal neurological signs and of an organic mental syndrome was also taken into account.

C. On follow-up assessments, a detailed neurological and psychiatric examination was carried out. A standardized clinical interview was performed in order to determine the patient's mental and emotional abilities influencing the social reintegration. Frequency of persisting headache was graded

semiquantitatively (never, rare, or often). The neurological condition as well as cognitive functions were again classified using the criteria mentioned above. Furthermore, the Glasgow Outcome Scale was used to determine the level of global functions. Dependence on other people's help and occupational level were also graded semiquantitatively by means of the Karnofsky Performance Status (26). The Karnofsky Performance Status has been widely used since his introduction in 1948, primarily for the evaluation of the impact of cancer and chemotherapeutic agents on patient's quality of life. The Karnofsky Performance Status has three alphabetic groups for classifying patients' ability to work, to carry on normal activity, and to care for themselves. These alphabetic groups are further divided into 11 categories which appear to cover all possible levels of function from normal to dead (41). Finally, note was taken on occupational functioning at the end of the observation period.

## 3. Outcome measures

The degree of disability in family relationships as well as in social functioning was scored semiquantitatively using a modified grading system proposed by Anderson et al. (3), ranging from 1—normally active, supportive family resp. community member, to 5—dead. Statistical analysis was performed using  $\chi^2$ -test and Student's *t*-test.

## RESULTS

### 1. Signs and criteria on admission

There were no relevant differences between patients with and without vascular malformations confirmed by angiography with regard to the familial and social (Table II) coping capabilities later on.

According to our results, the initial neurological examination is the best prognostic indicator for the development of familial as well as social handicaps in the long-term outcome (Table II).

The other clinical variables (sex, age on admission, and timing of admission) had no statistical influence on the long-term social prognosis. Surprisingly, the level of consciousness was also not related to the later quality of life. There was no significant correlation between presence and absence of an organic mental syndrome in the acute stage and the long-term familial or social disability. The Hunt & Hess grading system and the Glasgow Coma Scale also cannot serve as predictors with respect to the long-term disability in familial and social functioning (Table II).

### 2. Signs and criteria on discharge

Several outcome variables on discharge were analysed with respect to their prognostic relevance for long-term familial handicap: presence or absence of neurological deficits and an organic mental syndrome, the Glasgow Outcome Scale, and the Barthel index. None

Table II. Predictors of familial and social functioning in 67 patients after SAH (survivors). A. Disease, sex, age, clinical parameters in the acute stage

Criteria	n	Disability of familial functioning		Disability of social functioning	
		n	$\chi^2$	n	$\chi^2$
<b>Malformation</b>					
Yes	26	6	0.012	10	0.322
No	41	9		13	
<b>Sex</b>					
Male	35	9	0.467	11	0.273
Female	32	6		12	
<b>Age (SAH)</b>					
≤40	23	4	0.503	5	2.462
>40	44	11		18	
<b>Interval SAH/admission</b>					
≤72 h	22	6	0.450	8	0.060
>72 h	45	9		15	
<b>Impaired consciousness (acute)</b>					
No	26	7	0.503	9	0.002
Yes	41	8		14	
<b>Focal neurological signs (acute)</b>					
No	29	2	7.062**	5	6.622*
Yes	38	13		18	
<b>Organic mental syndrome (acute)</b>					
No	17	2	1.480	4	1.178
Yes	50	13		19	
<b>Glasgow-Coma-Score (acute)</b>					
15	20	5	0.112	6	0.237
<15	47	10		17	
<b>Hunt-Hess-Score (acute)</b>					
1-2	41	8	0.503	12	1.200
3-5	26	7		11	

\* $p < 0.05$ . \*\* $p < 0.01$ .

of these parameters did influence the late familial handicap (Table III). However, among patients with impaired capacity in ADL-functions on discharge—measured by means of the Barthel index—there was a significantly higher risk of social disablement at the end of the observation period as compared to patients independent in activities of daily living (Table III).

### 3. Signs and disability status on follow-up

With respect to familial functioning, statistical analysis revealed that patients without residual neurological and/or cognitive deficits had a significantly better outcome as compared to patients with neurological and/or mental sequelae at the end of the observation period. A clear-cut correlation was also found between the Glasgow Outcome score as well as the Karnofsky Performance Status, and the disability in family functioning on the other hand. There was also a

close relationship between the occupational level and the familial handicap (Table IV).

As also shown in Table IV, there were significant correlations between the social performance at the end of the observation period and the following parameter: organic mental syndrome, Glasgow Outcome score, Karnofsky Performance Status, and occupational abilities. The presence of focal neurological deficits was not related to the degree of the social handicap (Table IV).

There was no association between the frequency of headache complaints and the familial and social handicap (Tables IV).

## DISCUSSION

Survivors of stroke experience not only permanent physical impairment and dependence in activities of

Table III. Predictors of familial and social functioning in 67 patients after SAH (survivors). B. Situation on discharge

Criteria	n	Disability of familial functioning		Disability of social functioning	
		n <sup>a</sup>	χ <sup>2</sup>	n <sup>a</sup>	χ <sup>2</sup>
Focal neurological signs (discharge)					
No	36	6	1.466	10	1.481
Yes	31	9		13	
Organic mental syndrome (discharge)					
No	26	4	1.199	7	1.034
Yes	41	11		16	
Glasgow-Outcome-Score (discharge)					
5	38	7	0.795	10	2.500
<5	29	8		13	
Barthel-Score (discharge)					
100	37	6	1.812	7	8.704**
<100	30	9		16	

<sup>a</sup> Two patients deceased in the observation period are included.

\*\*  $p < 0.01$ .

daily living, but also persistent mental, emotional, and social dysfunction (28, 35, 45). Maladjustment to psychological, social, familial, and economical stress following stroke may impede rehabilitation (13, 22). Depression, anxiety, anger, social isolation, reduction in community involvement, economic strains causing life-style alterations, and disruption of family functioning were found in 32 to 60% of stroke survivors (13, 28, 32, 38). Espmark (12) reported that in the latter post-stroke period 75% of 52 juvenile stroke patients were depressed, and their psychological adjustment, rehabilitation, and return to work were significantly impeded by psychopathological symptoms. Depression and anxiety were found to be of similar importance for the quality of life as was physical disablement among stroke survivors at long-term follow-up (1, 35). A significant proportion of stroke survivors manifest social disability despite complete, or near complete physical restauration (28, 35, 45). Additionally, it has been recognized that cognitive and emotional sequelae often provide a greater handicap in the recovery process after severe head injury than do neurological disabilities (9, 24). Despite a satisfactory neurological recovery, many patients after SAH may also show personality changes and cognitive dysfunctions that interfere with rehabilitation and social reintegration (31).

However, in contrast to stroke and head injury populations, little is known about the long-term fa-

miliar and social dysfunction after SAH. There is also a lack of prognostic variables for predicting the definite social readjustment among SAH survivors. The knowledge of such prognostic factors may help to develop individual strategies in clinical management and further social support.

Before discussing the implications of the present study, some limitations have to be considered. First, it should be emphasized that this investigation deals with patients consecutively admitted to the Department of Neurology and, thus, is not defined epidemiologically. The study population consisted of mainly conservatively treated and hence, generally minor subarachnoid hemorrhage patients. Second, the incidence of SAH of unknown origin in recent series ranges between 7 and 33% (11, 18, 43, 48) and is 61% in our series. This considerable difference may be due to a combination of factors that include differences in admission management used in this area. It is common practice that patients with severe neurological symptoms and/or decreased level of consciousness often are admitted directly to the Department of Neurosurgery. On the other hand, referrals were actively solicited from general physicians, neurologists as well as internal departments. This management strategy may explain the high proportion of patients in our study group where no vascular malformation could be identified. Consequently, it was not the purpose of the current study to present the outcome of a selected

Table IV. Relation between familial and social functioning and the situation at the end of the observation period in 65 patients after SAH (survivors)

Criteria	n	Disability of familial functioning		Disability of social functioning	
		n	$\chi^2$	n	$\chi^2$
Headache					
Never	22	5	0.155	8	0.250
Rare/often	43	8		13	
Focal neurological signs					
No	39	3	9.231**	10	1.981
Yes	26	10		11	
Organic mental syndrome					
No	29	2	5.619*	3	11.549***
Yes	36	11		18	
Glasgow-Outcome-Score					
5	54	6	15.758***	14	5.942*
<5	11	7		7	
Karnofsky-Scale					
100	29	2	5.619*	4	8.207**
<100	36	11		17	
Occupational capacity					
Not impaired	31	2	11.949***	4	15.147***
Impaired	16	8		11	

\* Only patients who did not reach the retiring age.

\*  $p < 0.05$ . \*\*  $p < 0.01$ . \*\*\*  $p < 0.001$ .

population of SAH patients, but to define the prognostic value of clinical criteria with regard to the long-term familial and social readjustment among ambulatory survivors. Third, a marked observer variability in grading patients with SAH according to the system of Hunt & Hess was reported (29, 30).

Obviously, the most impaired SAH-patients are the most likely to undergo familial as well as social deterioration. This is in agreement with the results of the current study that the severity of physical and cognitive impairment at the end of the observation period showed positive correlation with the degree of social handicap. Regarding the occupational status at the end of the follow-up period, our findings confirm the notion that areas of social performance, such as work satisfaction and economic security, may also influence the degree of social handicap after SAH (34).

Taking into account clinical predictors in the acute stage, the prognosis of SAH concerning mortality and overall outcome depend on an array of criteria including the neurological condition with special emphasis on Hunt & Hess grading, level of consciousness, timing of admission, and age (4, 5, 6, 20, 27, 37, 39). On the basis of our results, we cannot agree to these

findings with respect to the long-term familial and social readjustment. Among survivors of SAH, the severity of the neurological deficit on admission was the only significant variable in identifying patients likely to develop long-term familial and social disablement. These data are consistent with our previous findings that the severity of the neurological deficits in the postacute stage of stroke can serve as a reliable predictor of the restrictions experienced in familial and social functioning later on (36). With respect to source of bleeding, our findings parallel recent results of Hijdra et al. (18). There were no relevant differences between patients with and without an aneurysm concerning functional outcome 3 months after SAH.

Regarding the degree of late social impairment outside the family, an additional prognostic indicator could be found: the ADL-status at time of discharge, using the widely adopted Barthel-Index. In accordance with this observation, there are reports that the initial Barthel-Index Score on admission to stroke rehabilitation units emerges as the most reliable predictive factor for rehabilitation outcome with respect to functional abilities (17, 42, 46). Consequently, if social isolation, depression, and other emotional dys-

functions impair the socialization of patients to a high level of motivation, this could be one possible explanation for the disappointing result that—with the exception of the severity of focal neurological signs on admission and the Barthel index on discharge—clinical variables of the acute stage cannot serve as prognostic predictors as to the long-term social handicap after SAH. Furthermore, behavioural changes such as impatience and impulsiveness may also impair familial and social life in a serious way (34). Besides, sexual functioning, dependent on physiological, pharmacological and psychological variables, may often show changes after SAH.

Since the goal of rehabilitation is to rehabilitate the person as a whole, the results of the current study suggest that our staff has to pay more attention to the psychosocial development of patients after SAH during inpatient rehabilitation as well as at follow-up examinations. Additionally, our findings indicate that other factors besides clinical variables in the acute stage and on discharge from the hospital have to be studied in order to improve outcome prediction with respect to the late social handicap.

The evidence that social and psychological factors may adversely affect medical treatment and rehabilitation outcome has to turn the attention to the question of what can be done to avert these effects. Our result suggest that the understanding of long-term outcome after SAH is enhanced by considering the dynamic character of individual, psychological, and psychosocial factors and its effect on patient's well-being (23).

Information and specific advice concerning cognitive and emotional impairment as well as behavioural changes to spouses and relatives will help to diminish familiar problems. Counselling sessions and group discussions for relatives of stroke victims have been found to be helpful (47). Anderson et al. (2) found that stroke survivors were not able to retain their maximum potential following discharge when they had limited support resources in the community. However, improving the education of family members had a positive effect on the patient's rehabilitative status. According to Melamed et al. (34), emotional acceptance of disability shows a positive correlation with involvement in meaningful activities six months after the cerebrovascular accident. Therefore, these authors suggested that emotional acceptance of disability facilitates the process of social readjustment.

Finally, we also have to encourage the families of

the patients to participate in the rehabilitation process to a greater extent. Education and in-service training of our staff in the provision of social and family services has to be reconsidered in order to improve the social coping process of our patients after SAH. Follow-up examinations should focus on neurological problems, functional capacity, and return to work but also on psychosocial readjustment.

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