Early Ambulation Produces Favorable Outcome and Nondemential State in Aneurysmal Subarachnoid Hemorrhage Patients Older than 70 Years of Age

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Key words
- Ambulation
- Elderly patients
- Subarachnoid hemorrhage

Abbreviations and Acronyms
CT: Computed tomography
CSF: Cerebrospinal fluid
GOS: Glasgow Outcome Scale
HDS-R: Hasegawa Dementis Scale-Revised
HH: Hunt-Hess
SAH: Subarachnoid hemorrhage

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BACKGROUND: **We analyzed consecutive subarachnoid hemorrhage (SAH) cases in patients older than 70 years of age who underwent aneurysm surgery. We report the influence of early ambulation on outcome in advanced-age SAH.**

METHODS: **From 2005 through 2010, 71 aneurysmal SAH cases whose Hunt-Hess grades ranged from 1 to 3 were included. All cases underwent clip ligation or coil embolization. Male to female ratio was 8/63; median age was 76 years (range, 70—87). We routinely have patients become ambulatory the day after surgery. The ambulation date was used to determine four groupings: 0—5 days, 6—10 days, 11—15 days, and 16 days and longer. We analyzed the relationship between ambulation date and the Glasgow Outcome Scale (GOS) or dementia at 30 days after the SAH. Favorable outcome was defined as good recovery and moderate disability according to the GOS. Dementia was screened by use of the revised-Hasegawa dementia scale. The chi-square test was used and a $P < 0.05$ was considered statistically significant.**

RESULTS: **Mean days to ambulation was 10.7 ± 9.3 SD days. Forty-eight cases (66%) achieved favorable outcome, and 27 cases (38%) reached a nondemential state. Early ambulation positively correlated with favorable GOS and post-operative nondemential state.**

CONCLUSIONS: **Elderly SAH patients with good Hunt-Hess grades should have a clip ligation or endovascular coiling. Early ambulation produces favorable outcome and a nondemential state in elderly SAH patients.**

INTRODUCTION

The number of elderly patients with subarachnoid hemorrhage (SAH) has been increasing in our society, which also is progressively advancing in age. However, outcomes for elderly SAH patients treated by clipping or coiling are poor because the initial SAH grade is poor, the brain is vulnerable, a high rate of vasospasm exists, and there are diseases of other organs present (1, 2, 4, 18, 19, 24, 25, 27). Many authors have reported that the prognostic factors for poor outcome are age and poor clinical status at admission (2-4, 8, 10, 18, 22, 24). However, interventions are not able to influence these factors and, in elderly patients, there are many pitfalls to treatment and high levels of disability caused by intensive care along with heart failure, respiratory distress, and diseases of other organs. Patients are forced to rest in bed for long periods, but bed rest induces muscle atrophy that decreases their abilities to perform in daily life and their cognitive function. In 1957, Rankin reported that important factors correlating with outcome in older patients with stroke were prolonged bed rest and lack of exercise (23). In our survey of the literature, we found no paper describing the relationship between ambulation and clinical outcome related to SAH. For safe ambulation, clip ligation or coil embolization of a ruptured aneurysm is necessary. We focused on good-grade, elderly SAH cases to investigate the effect of early ambulation, and we report on the optimal treatment strategy for elderly patients with SAH.

MATERIAL AND METHODS

This study was approved by the Hirosaki University Ethics Committee, and we acquired written, informed consent for this study from patients and/or family. From January 2005 through December 2010, we treated 314 patients with nontraumatic SAH, including 105 patients older than 70 years of age. Grades 4 and 5 in the Hunt-Hess (HH) grading system (20 cases), unknown origin (four cases), and conservative treatment cases (10 cases) were excluded from this study because early ambulation was not relevant to such cases and a poor HH grade has been demonstrated to have a negative influence on outcome (3). We analyzed 71 consecutive aneurysmal SAH patients older than 70 years of age (Table 1). Eight males and sixty-three females were included, and the median age was 76 years (range, 70—87). Clip ligation of the aneurysm took place in 56 cases and coil embolization in 15 cases. We do not routinely insert a drainage shunt to conserve cerebrospinal fluid (CSF) circulation, except in cases of obstructive hydrocephalus (Figure 1) (3). We maintained normovolemia in patients with the intravenous administration of fasudil hydrochloride. All patients were

Table 1. Characteristics of Analyzed Cases

Number of cases	71
Median age (IQR, range)	76 (73—80, 71—87)
Male/female	8/63
Hunt-Hess grade (1/2/3)	11/31/27
Premorbid conditions, n (%)	11 (15)
Treatment methods (Clipping:coiling)	56:15
Mean days to ambulation after the ictus	10.7 ± 9.3
Distribution of ambulation (days) (0—5/6—10/11—15/16-)	26/15/11/19
Symptomatic vasospasm, n (%)*	30 (45)
Angioplasty for vasospasm, n (%)	25 (83)
Postoperative complication, n (%)	13 (18)
Hydrocephalus†	13 (20)

IQR, interquartile range; SAH, subarachnoid hemorrhage.
*Three cases could not be definitely diagnosed as vasospasm because of postoperative complications within 14 days after the SAH.
†Five cases could not be included in this analysis because of death within 30 days after the SAH.

routinely ambulated on the day after the operation, following a determination of negative brain pathology via computed tomography (CT). Some patients refused ambulation because of headache, fatigue, or nausea.

We defined ambulation according to the Hauser ambulation index (9) and established four groups based on the ambulation date every 5 days (0—5, 6—10, 11—15, 16 and longer). When symptomatic vasospasm was suspected as the prime concern, triple-H therapy also was performed (3). Angiography was performed simultaneously and, for etiologic spastic artery, intra-arterial injection of medicines (fasudil and/or nicardipine) and/or balloon angioplasty was conducted.

To detect dementia, we used the revised Hasegawa dementia scale (HDS-R) (6, 12, 13, 16, 17). The HDS-R contains nine simple questions on patient age, date, location, repetition of words, minus calculations, reverse counting, short-term memory (words and objects) and the names of vegetables. The highest HDS-R score is 30 and the HDS-R threshold is 21. The sensitivity and specificity for the HDS-R are 0.9 and 0.82, respectively (16). We established three categories of dementia: severe (0—10), moderate (11—20), and normal (21—30). Other organ diseases that required continuous treatment were defined as premorbid conditions, except for hypertension because almost all patients suffered hypertension.

Also, other organ diseases that required additional treatment, including infection, were defined as postoperative complications. Hydrocephalus was defined as a case of ventricle-peritoneal shunt. Favorable outcome was defined as good recovery and moderate disability according to the Glasgow Outcome Scale (GOS). Coauthors J.S. and T.N., who were blinded to the patient data, independently assessed the outcome, and a consensus discussion was held.

We analyzed the influence of ambulation date on favorable GOS and the nondemential state at 30 days after SAH. A χ^2 test was used to analyze the relationship between ambulation date and clinical factors or outcome. (JMP 8.01, SAS institute Inc. Cary, NC). A $P < 0.05$ was considered statistically significant.

RESULTS

Premorbid conditions numbered 11 cases (15%), of which arthritis was the most common (Table 2). The most common aneurysm (38%) was that of the internal carotid artery (Table 3). The sites of the aneurysms were the same as previous reports (5, 10, 11, 15). Clip ligation of the aneurysm was performed in 79% of patients and coil embolization in 21%. Mean days to ambulation after the operation were 10.7 ± 9.3 days, and 37% patients ambulated within five days after the operation. Postoperative complications occurred in 13 cases (18%), and intracerebral hemorrhage was most common. Hydrocephalus occurred in 13 cases (20%). Forty-seven cases (67%) achieved favorable outcome, and 27 cases (38%) reached a nondemential state at 30 days after onset of SAH (Table 4).

χ^2 analysis revealed that early ambulation did not correlate with premorbid conditions, symptomatic vasospasm, postoperative complication, or hydrocephalus. However, early ambulation positively influenced favorable GOS and the nondemential state at 30 days after the operation ($P < 0.05$) (Table 5).

DISCUSSION

In this paper we reveal for the first time that early ambulation correlates significantly with favorable GOS and the nondemential state at 30 days after the operation. Early ambulation has not been discussed in the critical care of elderly patients with SAH. Favorable outcome in elderly patients with SAH had been

Table 2. Perioperative Complications

	Disease	Number of Cases
Premorbid conditions*	Arthritis	4
	Diabetes mellitus	2
	Cerebral infarction, dementia, Hypothyroidism, liver cirrhosis, lung edema, Parkinson disease	One each
Postoperative complications*	Intracerebral hemorrhage	4
	MRSA pneumonia	3
	Deep venous thrombosis	2
	Acute myocardial infarction, Aspiration pneumonia, Bleeding from myoma uteri, Cerebral embolism, Thrombocytopenia	One each

Arthritis decreases abilities in daily life.
MRSA, methicillin-resistant *Staphylococcus aureus*.
*One case suffered double complications.

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