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Rebleeding from ruptured intracranial aneurysms in North Eastern Province of Japan. A cooperative study

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Abstract

Object: Rebleeding from ruptured intracranial aneurysms is a major cause of death and disability. With regard to the factors that precipitate the rebleeding and influence the time course after initial bleeding, previous reports differ in their results, and the number of patients investigated was not sufficient for valid conclusions. This study was thus designed to clarify the factors related to rebleeding from ruptured intracranial aneurysms in a large group of patients of the North Eastern Province of Japan.
Methods: We found 181 patients with rebleeding after hospitalization among 5612 cases of ruptured intracranial aneurysms from January 1997 to December 2001 in 33 major hospitals in the North Eastern Province of Japan. We analyzed the data with respect to the time course after bleeding and rebleeding, the arterial blood pressure, the situation when rebleeding occurred, the methods of neuroimaging, the level of consciousness, the treatment and the outcome.
Results: Of 181 patients who were hospitalized, rebleeding occurred in 65 (35.9%) within 3 h and 88 (48.6%) within 6 h after the initial subarachnoid hemorrhage (SAH). The consciousness level before the rebleeding varied widely in distribution, but belonged to the drowsiness or less [Japan coma scale (JCS) single-digit] in 83 patients (45.8%), but after rebleeding, JCS triple-digits (semicoma to coma) included 152 patients (84.0%). Systolic arterial blood pressure prior to rebleeding was most commonly between 120 and 140 mmHg. Rebleeding did occur more frequently during angiography (totally 29 patients, 20%) and much less frequently during 3D-CTA and MRA procedures (a single case). Treatment consisted of aneurysm neck clipping in 72 patients (40.0%), endovascular therapy with coils in 4 patients (2.2%) and conservative ones in 103 patients (56.9%). As to outcome, 109 patients with rebleeding (60.2%) died in 3 months following initial SAH.
Conclusion: Rebleeding occurs more frequently in the earlier period after the initial SAH than previously believed. Thus, more aggressive pharmacologically induced systemic arterial hypotension appears to be important for preventing rebleeding but ultimate outcome of more aggressive hypotension is yet to be determined. If feasible, in order to avoid catheter-angiography related rebleeding, evaluations solely with 3D-CTA and MRA should be in consideration and earlier surgical intervention seems essential as rebleeding does occur often within the first 3 h of onset.
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Keywords: Rebleeding; Ruptured intracranial aneurysm; Subarachnoid hemorrhage; Induced hypotension; Arterial blood pressure; CT angiography

1. Introduction

Subarachnoid hemorrhage (SAH) from ruptured intracranial aneurysm is a serious problem with high mortality and morbidity. Rebleeding is a major cause of death and disability in addition to those caused by the primary bleeding and delayed ischemic deterioration due to angiospasm [1–5]. The main purpose of neurosurgical treatment of ruptured aneurysms is thus to prevent rebleeding. Once rebleeding

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Table 1
The summary of clinical parameters of 181 patients with rebleeding (among totally 5612 patients with ruptured aneurysms between 1997 and 2001)

Procedure	No.	%
Total patients	181	
Sex		
Male	55	30.4
Female	126	69.6
Diagnostic procedures of aneurysms		
Cerebral angiography alone	137	75.7
3D-CTA alone	26	14.4
MRA alone	6	3.3
Cerebral angiography + 3D-CTA	8	4.4
Cerebral angiography + MRA	2	1.1
The localization of rebleeding aneurysm		
Aco	55	30.4
ICA	47	26.0
MCA	39	21.5
VBA	30	16.6
The others	10	5.5
Treatment		
Neck clipping	72	40.0
Endo-vascular therapy	4	2.2
Non-surgical conservative therapy	103	56.9
Outcome		
Good condition	32	17.7
Moderate disability	14	7.7
Severe disability	13	7.2
Vegetative state	13	7.2
Death	109	60.2

Aco indicates anterior communicating artery; ICA, internal carotid artery; MCA, middle cerebral artery; VBA, vertebrobasilar artery.

occurs, the surgical outcome is much less favorable or the surgery may no longer be feasible.

It had been reported that the highest risk of rebleeding is during the latter part of the first week or the beginning of the second week after initial aneurysmal rupture [4]. The Cooperative Aneurysm Study of 2265 patients reported in 1983 showed that the rate of rebleeding was 4.1% within the first 24 h [3]. Several recent reports have, however, shown that the most vulnerable period for rebleeding is during the very early stage of SAH, that is, within several hours [6,7] or 6 h [2] after the initial bleeding.

With respect to the factors that precipitate rebleeding, the abrupt rise of blood pressure [8–10] and cerebral angiography [2,11–13] are believed to be most important. Thus, several reports have maintained the importance of lowering of the blood pressure and suggested that systolic blood pressure be lowered to below 140 mmHg, to 100–120 or even lower [9]. Conventional catheter angiography, including intra-arterial DSA, is still the gold standard for diagnosing and evaluating cerebral aneurysms, but accumulating evidence indicates that three dimensional CT angiography (3D-CTA) is safer and better in diagnostic capability than the direct catheter angiography [15–18].

Because of conflicting reports on the peak incidence of rebleeding after the initial rupture and on the factors that precipitate rebleeding, we have analyzed the cases collected by the 33 major neurosurgical centers of the North Eastern Province of Japan (NEP; Tohoku), the population of which is approximately 10 million (7.8% of the total population of Japan), under the auspices of the Tohoku Society of Stroke Research (TSSR).

2. Methods

The case investigation forms for this retrospective study were prepared by a committee consisted of the neurology and neurosurgery representatives of each of six sub-regions. We requested the neurosurgeons and neurologists who are members of TSSR to fill out the case investigation forms.

The criteria for inclusion of a case were as follows: 1. Rebleeding from ruptured intracranial aneurysms that occurred in the hospital setting of up to 4 weeks from January 1997 to December 2001. 2. After the initial SAH, at least brain computed tomography (CT) was performed to confirm the bleed in the subarachnoid space. 3. The rebleeding was diagnosed from the neurological symptoms, or from CT or from both. 4. The ruptured intracranial aneurysm was confirmed by cerebral

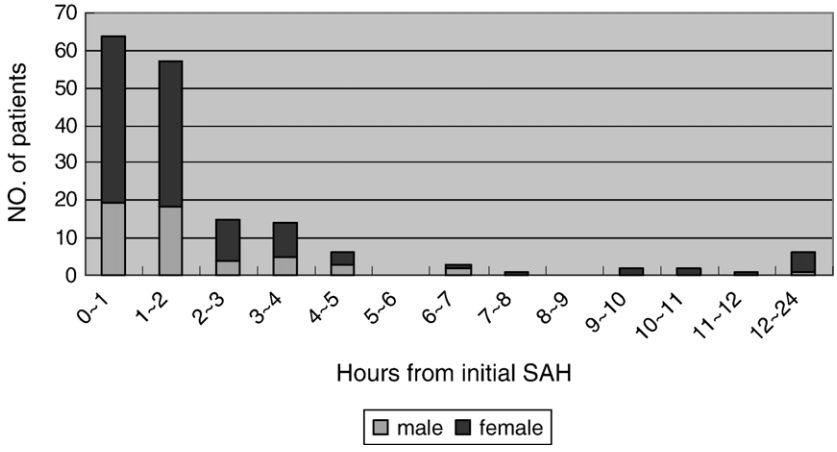

Fig. 1. Time course from the first SAH to admission of the patients with aneurismal rebleeding. Of the 181 patients, 121 (66.8%) were admitted within 2 h, and 150 (82.8%) were admitted within 4 h after the initial bleeding.

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