Clinical Characteristics of Stroke Occurring while Bathing

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Background: Stroke can occur during any human activity. Although cardiac arrests or drowning accidents while bathing have been studied extensively, there are few studies focusing on stroke occurring while bathing. The objectives of this study were to evaluate the clinical characteristics of stroke occurring while bathing and the association between stroke and drowning accidents. *Methods:* Clinical data prospectively acquired between January 2011 and December 2015 on 1939 patients with stroke (1224 cerebral infarctions [CIs], 505 intracerebral hemorrhages [ICHs], and 210 subarachnoid hemorrhages [SAHs]) were reviewed to identify patients who sustained a stroke while bathing. The ratio of bathing-related strokes to strokes occurring during other activities was evaluated. Moreover, the demographics of these 2 groups were compared in each stroke type. *Results:* Among the 1939 patients, 78 (CI, 32; ICH, 28; and SAH, 18) sustained a stroke while bathing. The ratio of bathing to other activities in the SAH group was the highest (8.6%), followed by the ICH group (5.5%), whereas that in the CI group was the lowest (2.6%). Regardless of stroke type, only a minority of patients were found to have collapsed inside the bathtub. *Conclusions:* The higher ratio of bathing in hemorrhagic strokes may indicate that there is a small risk of hemorrhagic stroke while bathing in vulnerable subjects. This retrospective study did not establish a causal relationship between bathing and stroke nor identify risk factors, which means that future prospective studies are warranted. The finding that the great majority of bathing-related stroke patients were found to have collapsed outside the bathtub suggests that the involvement of stroke in drowning accidents in the bathtub may be small. **Key Words:** Bathing—bathroom—drowning accident—stroke.

Introduction

Stroke can occur during any human activity and at any location. Bathing is unique from the perspective of stroke medicine: although bathing has generally been considered safe in people with premorbid conditions,[1,2] acute change in body temperature may influence autonomic functions.[3-7] Subsequent hemodynamic instability, that is, fluctuation in blood pressures or heart rates, may result in vascular accidents in vulnerable subjects.[8,9] Cardiac arrests or drowning accidents occurring while bathing have been studied extensively in Japan.[10-14] In contrast, the incidence or clinical characteristics of stroke occurring while bathing have been reported only rarely.[15] The main objective of the present study was to clarify the clinical characteristics of stroke occurring while bathing. In addition, the possible involvement of stroke in drowning accidents occurring in the bathroom was evaluated. In this paper, the word "bathroom" signifies a space for bathing, including bathtub, wash place, and dressing room, and does not signify toilet or restroom.

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Methods

Study Population

This is a single-center, retrospective, observational study using prospectively acquired data. The study protocol was approved by our institution's Ethics Committee. All stroke patients were treated by board-certified stroke specialists according to the Japanese Guidelines for the Management of Stroke.[16] Our institution, a regional stroke center serving a population of 800,000, used an integrated clinical database CAP-2000 (Nihon Koden, Tokyo, Japan) since 2010. For all stroke patients admitted via our emergency department, stroke types and presenting symptoms, as well as detailed information on when, where, and how the patients' symptoms developed, were registered on the database by emergency department residents. The information was obtained either from patients, their surrogates, or from paramedics. The patients were also asked about activities before symptom onset. We modified the classification of human daily activities by Hayashi et al,[17] in which the activities were classified into 8 categories (sleeping, resting, eating, walking, exercising/working heavily, using the toilet, bathing, and other activities). Stroke types were classified into cerebral infarction (CI), spontaneous intracerebral hemorrhage (ICH), and aneurysmal subarachnoid hemorrhage (SAH). Furthermore, CIs were classified into 4 subtypes (large-artery atherosclerosis, cardioembolism, small-vessel occlusion, and other ischemic strokes) based on the Trial of Org 10172 in Acute Stroke Treatment (TOAST) classification.[18] Board-certified neurologists and neurosurgeons were in charge of the classification. We used the dataset of 1939 consecutive adult stroke patients admitted to our institution between January 2011 and December 2015. Patients who sustained a stroke while taking a shower were excluded from the analysis. For statistical analysis, the Fisher exact test was used for categorical and unpaired *t*-test was used for continuous variables. JMP (SAS Institute, Cary, NC) was used for statistical analysis. Data were indicated by mean ± standard deviation, and a *P* value less than .05 was considered significant.

Results

Demographics

The 1939 stroke patients consisted of 1224 CI (762 men and 462 women, mean age 71.3 ± 12.3 years), 505 ICH (313 men and 192 women, mean age 66.2 ± 14.7 years), and 210 SAH (76 men and 134 women, mean age 64.5 ± 14.3 years) patients. Seventy-eight patients (39 men and 39 women, mean age 71.2 ± 12.4 years) sustained a stroke while bathing. Therefore, the frequency of bathing-related stroke in our cohort was 4.0% (78 of the 1939 patients). Detailed information on the temporal relationship between bathing and stroke onset was obtained from 35 patients (45%) and from family members or paramedics in the other 43 (55%). Whereas most bathing-related strokes occurred in home baths, 6 patients sustained a stroke while taking a public bath (*sento* or *onsen*). The 78 patients were classified based on stroke type as CI (32), ICH (28), and SAH (18). The relationship between daily activities and stroke type is illustrated in Figure 1. The ratio of bathing to other activities in the SAH group was the highest (8.6%), followed by the ICH group (5.5%), and that in the CI group was the lowest (2.6%). The ratios differed significantly between hemorrhagic strokes and CI. The 78 patients were trichotomized based on their age (<50, 50-65, and >65 years) in each stroke type to evaluate the possible influence of aging (Fig 2). There was a proportional increase in the number of patients relative to the graded ages in all stroke types.

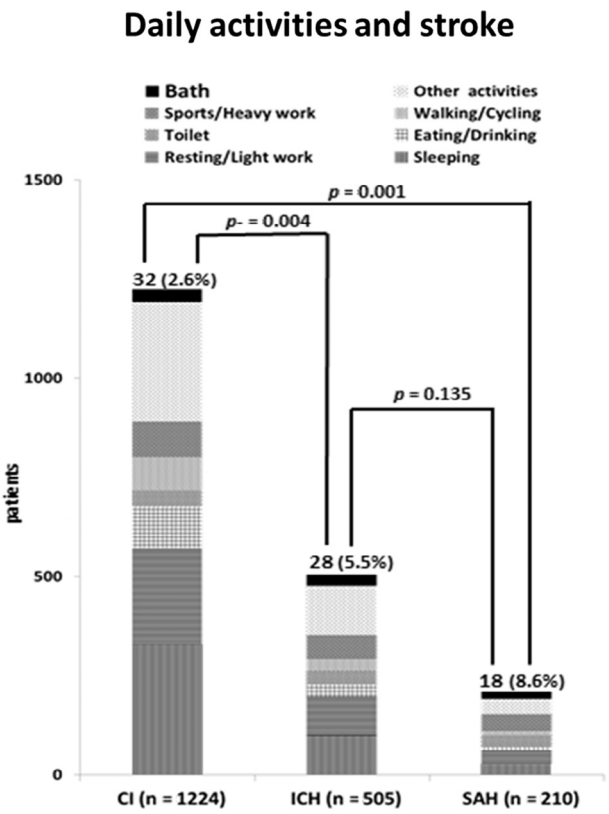

Figure 1. *Relationship between daily activities and stoke in 1939 patients with stroke (CI, 1224; ICH, 505; and SAH, 210). A total of 78 patients (CI, 32; ICH, 28; and SAH, 18) sustained a stroke while bathing. The ratio of bathing to other activities was significantly higher in SAH and ICH compared with CI. CI, cerebral infarction; ICH, intracerebral hemorrhage; SAH, subarachnoid hemorrhage.*

Subsequently, demographics were compared between patients who sustained a stroke while bathing and those who did so during other activities (Table 1). In all stroke types, patients with bathing-related stroke were older, although the difference was statistically significant only in the ICH group (Table 1, B). In the CI group, the bathing-related patients presented with altered mental status defined by a Glasgow Coma Scale score of 14 or lower more frequently (61% versus 36%, *P* = .024) (Table 1, A). There