

Prognosis of Intracerebral Hemorrhage after Conservative Treatment

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Background: The aim of this population-based study was to determine the short-term prognosis of patients treated conservatively for spontaneous intracerebral hemorrhage (ICH), a disease with a high rate of mortality. *Methods:* During a 39-month period beginning in October 2007, 594 patients (mean age 72 ± 12 years; 52% female; median National Institutes of Health Stroke Scale [NIHSS] score 9) with spontaneous ICH were enrolled in this prospective, population-based study. *Results:* Of 594 patients, 74 (12%) died during hospitalization (10.3 ± 7 days). Adjusted logistic regression analyses revealed that the in-hospital mortality rate was significantly associated with age >80 years (odds ratio [OR] 3.1; 95% confidence interval [CI] 1.3-7.5; $P = .01$), NIHSS score >15 (OR 3.3; 95% CI 1.4-9.7; $P = .007$), unconsciousness at admission (OR 5.3; 95% CI 2.0-13.6; $P = .001$), and cerebral edema detected by cranial computed tomography at admission (OR 14.7; 95% CI 6.2-34.6; $P < .001$). At hospital discharge, 329 patients (63%) agreed to participate in the inquiry. At 3 months of follow-up, 55 (18%) of 309 patients died. The 3-month mortality rate correlated significantly with age >80 years (OR 3.5; 95% CI 1.4-8.7; $P = .008$), previous stroke (OR 4.1; 95% CI 1.6-10.3; $P = .002$), unconsciousness at admission (OR 5.7; 95% CI 2.4-13.9; $P = .001$), pneumonia suffered during hospitalization (OR 3.3; 95% CI 1.2-9.6; $P = .02$), and cerebral edema (OR 5.7; 95% CI 2.3-13.8; $P < .001$). *Conclusions:* Our study may help clinicians estimate the short-term prognosis of patients treated conservatively for ICH. **Key Words:** Conservative treatment—epidemiology—intracerebral hemorrhage—mortality—prognosis—stroke.

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Intracerebral hemorrhage (ICH) is the second most common form of stroke, comprising 10% to 20% of all strokes worldwide.¹⁻⁴ It is characterized as the most lethal early form of stroke, with high rates of mortality—not only during the initial hospitalization phase (39%), but also 3 months later (33.5%)—and significant long-term disability.^{5,6} In cases of primary ICH, spontaneous, nontraumatic bleeding occurs from intraparenchymal

blood vessels as a result of long-standing arterial hypertension or cerebral amyloid angiopathy.⁷ The basal ganglia (34%) and lobar regions (25%) are the most common sites of ICH.⁸ Approximately 10% to 20% of ICH events are secondary and are associated with vascular malformation, coagulopathy, or neoplasm. No surgical or medical intervention has been shown to improve patient outcome after ICH.⁹ Data about the short-term prognosis after ICH in patients who managed conservatively are sparse.

The aim of this population-based study is to estimate the rates of mortality during hospitalization and at 3 months after discharge from hospital in patients who were conservatively treated for spontaneous ICH.

Methods

Study Design

Over a period of 39 months, 15 hospitals from the benchmarking project Quality of Stroke Treatment in

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Received November 6, 2012; revision received November 25, 2012; accepted December 28, 2012.

The Quality of Stroke Treatment in Schleswig-Holstein (QugSS2) was funded by the Bundesministerium für Gesundheit und Soziale Sicherung (BMGS-AZ 217-43794-6/7).

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1052-3057/\$ - see front matter

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<http://dx.doi.org/10.1016/j.jstrokecerebrovasdis.2012.12.018>

Schleswig-Holstein (QugSS2) participated in our study. The benchmarking project was previously described and included 2 departments of neurology at university hospitals and 13 departments of neurology and internal medicine at general hospitals.^{10,11}

All patients >18 years of age who suffered a spontaneous ICH and were scheduled for conservative treatment at participating hospitals between October 2007 and December 2010 were recruited for the present study. The criteria for inclusion included admission with spontaneous ICH according to a diagnosis made by cranial computed tomography (CCT); main place of residence in the German federal state of Schleswig-Holstein; and the provision of written informed consent to participate in the study. The exclusion criteria were as follows: traumatic hemorrhage, subarachnoid hemorrhage, and atypical hemorrhage caused by cerebral venous sinus thrombosis, as well as secondary hemorrhage caused by neoplasm or stroke.

At discharge from the hospital, the patients (or, in some cases, their caregivers) were asked whether they wished to participate in a 3-month follow-up inquiry. If the patients (or caregivers) agreed to participate in the follow-up inquiry and provided written informed consent, they were contacted by letter and then questioned during a telephone interview 3 months after discharge. When patients were unavailable, we determined patient mortality by contacting the local Residents' Registration Office, which documents all deaths of residents. The procedures for documentation and data collection followed a uniform study manual. Baseline characteristics at admission (Table 1)—sex, age, National Institutes of Health Stroke Scale (NIHSS) score, modified Rankin Scale (mRS) score at admission, neurologic deficits, vascular risk factors, history of stroke, localization of ICH in accordance with the *International Classification of Diseases, 10th Revision* (ICD-10), complications during hospitalization, and cerebral edema (defined as a hypodense [darker] area surrounding the hemorrhage as detected by CCT, with or without a compression of the brain ventricle and middle shift)—were documented and analyzed. The study was approved by the local ethics committee of the University of Lübeck.

Conservative Treatment

The present study included patients with ICH who were managed conservatively. The conservative management of patients with ICH was performed in accordance with the guidelines of the German Society of Neurology that were previously described.^{12,13} Admissions of ICH patients are usually made to the stroke unit. In cases of respiratory insufficiency and the need of mechanical respiratory, patients were admitted to the intensive care unit. A stroke specialist or neurologist examines the neurologic status and records the NIHSS score every 6 hours. Briefly, conservative treatment includes the monitoring of

vital parameters and controlling of blood pressure. Blood pressure should be measured using intra-arterial blood pressure. The systolic pressure has to be kept down, preferably at (<160 mm Hg), and the diastolic pressure at (<90 mm Hg), depending on other diseases and whether hypertension is detected. In cases of cerebral edema with a midline shift, intravenous treatment with Glycerosteril (Fresenius Kabi, Germany) and/or Mannitol (SERAG WIESNER, Germany) should be added. In addition, a dysphagia test, a speech assessment, and physiotherapy should be performed as soon as possible.

Statistical Analysis

SPSS software (version 20; SPSS Inc, Chicago, IL) was used to analyze the data. The data were described with mean and standard deviation values for continuous variables, absolute numbers and percentages for categorical variables, and median and interquartile range values for ordinal variables. The Chi square test was used to determine the correlation between categorical variables, the *t* test between continuous variables, and the Mann-Whitney test between ordinal variables. Adjusted logistic regression analysis was carried out to estimate the odds ratio (OR). All variables of clinical parameters with a *P* value <.1 were entered into the logistic regression model. *P* <.05 was considered statistically significant.

Results

This prospective study included 594 patients (mean age 72.8 ± 12 years; 52% female; median NIHSS score 9 [interquartile range {IQR} 3-16]) who were conservatively treated for spontaneous ICH. All patients underwent 1 CCT scan at admission, and 153 (26%) underwent an additional magnetic resonance imaging (MRI) scan of the brain as part of the diagnostic evaluation of spontaneous ICH.

Of these 594 patients, 74 (12%) died during hospitalization (mean duration of hospital stay 10.3 ± 7 days). The mean duration of hospitalization for patients who died was significantly shorter than for those who survived and were discharged from the hospital alive (4.9 *v* 11 days; *P* <.001). At discharge, the median mRS of patients who survived was 3 (IQR 2-4).

Table 1 shows the baseline characteristics and risk factors associated with in-hospital mortality in patients with spontaneous ICH who underwent conservative treatment. Adjusted logistic regression analyses revealed that the in-hospital mortality rate was significantly associated with age >80 years (OR 3.1; 95% confidence interval [CI] 1.3-7.5; *P* = .01), NIHSS score >15 (OR 3.3; 95% CI 1.4-9.7; *P* = .007), unconsciousness at admission (OR 5.3; 95% CI 2.0-13.6; *P* = .001), and cerebral edema detected by CCT at admission (OR 14.7; 95% CI 6.2-34.6; *P* <.001).

At discharge from the hospital, 329 (63%) of 520 patients agreed to participate in the follow-up inquiry. At

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