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A hospital-based study on long-term mortality and predictive factors after spontaneous intracerebral hemorrhage from Turkey

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Abstract

Background: There is no previous study on long-term mortality following spontaneous intracerebral hemorrhage in Turkey. The aim of this study is to investigate long-term mortality following spontaneous intracerebral hemorrhage and the predictive factors for mortality in hospitalized patients in a medical centre in Turkey. *Methods:* We retrospectively reviewed the hospital records of patients aged 18 and above, hospitalized with spontaneous intracerebral hemorrhage between January 2004 and March 2005, in the Dr. Lütfi Kırdar Kartal Training and Research Hospital, Istanbul. Demographic data, vascular risk factors, Glasgow Coma Scale score and neuroimaging findings were abstracted. Anamnestic findings consisted of the history of hypertension, diabetes mellitus, acetyl salicylic acid-warfarin use and family history of stroke. The anatomic localization, volume, and intraventricular extension of hematoma were determined on CT images. The patients or their family members were called up to determine 30-day and one-year mortality rates. *Results:* Thirty-day mortality was 38.3% and one-year mortality was 49.6%. The predictive factors for mortality Glasgow Coma Scale score on admission, blood glucose, hematoma volume and intraventricular extension of hematoma. Thirty-day mortality and one-year mortality did not differ with sex ($p>0.05$). All patients who have hematoma volume of over 60 cm^3 died within 30 days. There were correlation between hematoma volume and both 30-day and one-year mortality rates ($p<0.001$). The patients who had hematoma with extension to ventricles had significantly higher 30-day and one-year mortality rates ($p<0.001$).
Conclusions: Mortality rate after spontaneous intracerebral hemorrhage was high as in other studies from elsewhere. Low level of consciousness on admission and high volume of hematoma were predictive of poor prognosis.

INTRODUCTION

Previous study by Qureshi has shown that mortality rate following spontaneous intracerebral hemorrhage is nearly 50% in 30 days, and there is no effective treatment.[1] Various other studies have shown that age, hematoma volume and localization, anticoagulant use and level of consciousness to be predictive factors for mortality.[2-4] However, whereas short-term mortality following spontaneous intracerebral hemorrhage is known to be high, long-term mortality following the hemorrahge is not well documented, and there is also lack of documentation on the recent trends in the mortality rate.[5] There has been no previous study on long-term mortality following spontaneous intracerebral hemorrhage in Turkey. This study aimed to investigate the long-term mortality and its predictive factors for spontaneous intracerebral hemorrhage in a cohort of Turkish in-patients.

METHODS

We studied patients aged 18 and over, who were hospitalized with spontaneous intracerebral hemorrhage at the Neurology Department, Dr Lütfi Kırdar Kartal Research and Training Hospital, between January 1, 2004 and March 31, 2005. Dr Lütfi Kırdar Kartal Research and Training Hospital is the largest hospital having the largest stroke center on the Asian part of Istanbul. An average of 40 patients is being admited to the Emergency Unit of the Hospital daily, and 5-10 of them are due to stroke. There are Neurologist and Neurosurgeon on duty for 24 hours in the Emergency Unit with a triage and referral system. Patients with intracerebral hematoma, who

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requires surgical intervention upon consultation by neurologist and neurosurgeon, and those having arteriovenous malformation or aneurysm are referred to Neurosurgery Department. Other patients are hospitalized under Neurology care.

The study was approved by the Ethical Committee of the Hospital, with informed consent. For each study patient, demographic data (age and sex), risk factors for cerebrovascular disease, Glasgow Coma Scale score and neuroimaging findings recorded on admission were abstracted. Anamnestic findings abstracted included the history of hypertension, diabetes mellitus, acetyl salicylic acid / warfarin use and family history of stroke. The anatomic localizations and volumes of hematoma were determined based on CT images. Total volume of hematoma was estimated using the formula (4/3 π a x b x c), where a, b, and c represented the respective radii in 3-dimensional neuroimaging. Variables in relation to the localization of hemorrhage included basal ganglia, thalamus, cerebellum, brain stem and lobar topographic involvements. Intraventricular extension of hematoma was also noted. All the data were recorded in a standardized form.

The patients or their family members were called up to determine 30-day and 1-year mortality rates. Eight patients who were not contactable by phone were excluded in this study. The dates of death were recorded; the mortality rates and the predictive factors for mortality were then analysed.

Statistical analysis was performed using SPSS software, version 11.05. For categorical variables, the data were summarized with frequency and contingency tables. For continuous variables, data were presented as mean ± SD unless otherwise specified. Comparisons were made using chi-square test or Fisher's exact test for categorical variables and t-test or Mann-Whitney U test for continuous ones. P values <0.05 were taken as statistically significant. No statistical analysis could be performed for hematoma site because of inappropriate data distribution. We could not evaluate cigarette and alcohol consumption because of insufficient data in the patient files.

RESULTS

One hundred and thirty three patients with spontaneous intracerebral hemorrhage were included in this analysis. Of these, 64 (48.1%) were females and 69 (51.9%) were males. The mean age of the study patients was 65.9±11.8 years. Thirty-day mortality and one-year mortality were 38.3% and 49.6%, respectively.

The 30-day mortality and one-year mortality did not differ with respect to sex ($p>0.05$; Table 1). While there was no significant difference in 30-day mortality between age groups, the one-year mortality was significantly higher in the group aged above-69 years ($p=0.007$). The mean Glasgow Coma Scale score on admission was found to be 10.8±3.5. All the patients having Glasgow Coma Scale score of less than 8 on admission died within 30 days (Table 1). There was a strong correlation between Glasgow Coma Scale score and both 30-day mortality and one-year mortality rates ($p<0.001$). There was no significant difference in the 30-day and one-year mortality rates with respect to the history of cerebrovascular disease, hypertension, diabetes mellitus, acetyl salicylic acid / warfarin use and family history of stroke in patients ($p>0.05$ for all).

There was no significant difference between the mean blood cholesterol and triglyceride levels on admission of patients who died within one year and those who survived ($p>0.05$). But, the mean blood sugar levels on admission was higher for those who died by 30-days mortality ($p<0.001$) or one-year ($p=0.004$). All the patients who have hematoma volume of over 60 cm^3 died within 30 days. There was correlation between hematoma volume and both 30-day and one-year mortality rates ($p<0.001$). The patients who had hematoma with extension to ventricles also had significantly higher 30-day and one-year mortality rates ($p<0.001$). We could not analyze the correlation between hematoma site and mortality rates because of inadequate data.

DISCUSSION

In this study, we found 30-day mortality and one-year mortality after spontaneous intracerebral hematoma to be 38.3% and 49.6%, respectively in a hospital in Istanbul, Turkey. These mortality data fall into the range reported from elsewhere. In a US study conducted 13 years ago, in-hospital mortality rate in black patients was found to be 50.2%.[6] An in-hospital mortality rate reported from Iran was 46.1%.[3] In a European study, 30-day and one-year mortality rates were found to be 37% and 49.6%, respectively.[8] A 30-day mortality rate of 39.7% was reported from Pakistan.[9] On the other hand, a relatively lower in-hospital mortaliy of 20.1% was reported from Japan.[7] It should be noted that there was long hospital stay of 64.9 days for the Japanese patients. Thus, there was high mortality rates following spontaneous intracerebral hemorrhage in reports from all over

Table 1. Results of statistical analyses in 133 patients with intracerebral hemorrhage

	Died within 30 days*	Died within one year*	Survived beyond one year*	p-value (30-days)	p-value (one-year)
Demographic features					
Men	28 (40.6%)	34 (49.3%)	35 (50.7%)	p=0.582	p=0.933
Women	23 (35.9%)	32 (50.0%)	32 (50.0%)		
Age, years, mean ± SD	67.6 ± 12.1	67.8 ± 11.5	64.0 ± 11.9	p=0.179	p=0.070
Age > 69	27 (45.0%)	37 (61.7%)	23 (38.3%)	p=0.152	p=0.012
Cardiovascular risk factors					
Cerebrovascular disease	8 (50.0%)	9 (56.3%)	7 (43.8%)	p=0.307	p=0.572
Hypertension	45 (39.1%)	57 (49.6%)	58 (50.4%)	p=0.638	p=0.973
Diabetes mellitus	6 (40.0%)	7 (46.7%)	8 (53.3%)	p=0.889	p=0.808
Family history of stroke	2 (20.0%)	2 (20.0%)	8 (80.0%)	p=0.316	p=0.096
Acetyl salicylic acid use	8 (27.6%)	14 (48.3%)	15 (51.7%)	p=0.178	p=0.870
Clinical and laboratory findings					
Blood glucose, mg/dL, mean ± SD	146.6±50.4	137.5±49.0	112.9±47.9	p<0.001	p=0.004
Cholesterol, mg/dL, mean ± SD	188.2±37.9	194.9±40.2	195.1±39.7	p=0.122	p=0.972
Triglycerides, mg/dL, mean ± SD	105.3±50.4	105.7±47.0	125.8±79.5	p=0.148	p=0.079
Clinical findings					
Glasgow Coma Scale score					
< 8	27 (100.0%)	27 (100.0%)	0 (0.0%)		
8-12	16 (45.7%)	20 (57.1%)	15 (42.9%)	p<0.001	p<0.001
>12	8 (11.3%)	19 (26.8%)	52 (73.2%)		
Neuroimaging findings					
Hematoma volume, ml, mean±SD	22.3±19.3	19.6±18.3	4.6±4.9	p<0.001	p<0.001
Intraventricular extension	38 (66.7%)	44 (77.2%)		p<0.001	p<0.001
Location of hematoma					
Lobar	7 (53.8%)	7 (53.8%)	6 (46.2%)		
Deep	36 (35.0%)	48 (46.6%)	55 (53.4%)	non-applicable	non-applicable
Cerebellar	4 (44.4%)	7 (77.8%)	2 (22.2%)		
Brainstem	4 (50.0%)	4 (50.0%)	4 (50.0%)		

**n (%), unless specified in the first column; percentages belong to rows; percentages in the second column include those in the first column; total of percentages in the second and third columns is 100%.*

the world. It is uncertain whether socioeconomic factors also play a role in the mortality. In a recent US study with two cohorts, one having vascular malformation and the other using anticoagulants, 30-day and one-year mortality rates were also found to be high. The 30-day and one-year mortality rates in the vascular malformation group were 48% and 59%, and 44% and 52% for the anti-coagulant group.[2]

We found that both 30-day and one-year mortality rates increase as admission Glasgow Coma Scale score decreases. Thus, Glasgow Coma Scale score is useful in determining prognosis in patients with spontaneous intracerebral hemorrhage. This is similar to many other studies.[1-4,10,11] We also found the mean blood glucose levels on admission to be significantly higher in those who died by 30-days and one-year. This is also similar to another study reporting 28-day mortality.[12]

The percentage of our patients with a history of hypertension was very high (86.5%). However, we did not find any correlation between history of hypertension and both 30-day and one-year mortality. The relationship between history of hypertension and mortality following intracerebral hematoma is variable in the literature.[12-14] In our study, 30-day mortality and one-year mortality did not differ with respect to sex. One the other hand, while there was no significant difference in

30-day mortality for age, one-year mortality was significantly higher in those aged 69 years and above (p=0.007). The increased mortality with advanced age has been reported in many other studies.[3,6,15-17] We did not find significant difference in 30-day and one-year mortality rates with respect to the history of cerebrovascular disease, hypertension, diabetes, acetyl salicylic acid use and blood levels of cholesterol and triglycerides. In another study, low levels of cholesterol and triglycerides on admission were found to be a strong predictive factor for hospital death.[18]

We found correlation between hematoma volume and both 30-day and one-year mortality rates. This is consistent with results from many other previous studies.[2-4,7,9,19] Extension of hematoma to ventricles as a risk factor for increased mortality is also found in some other studies.[20] This is a single-center hospital-based study, thus the results may not necessarily reflect the picture all of Turkey. A larger multi-center studies has been planned to determine the mortality following intracerebral hemorrhage to determine the prognosis of intracerebral hemorrhage from wider populations in Turkey.

To conclude, spontaneous intracerebral hemorrhage has a high mortality in a medical centre in Istanbul, Turkey, similar to previous data from other parts of the world. Low Glasgow Coma Scale score, large hematoma volume, extension to ventricles and high blood glucose level are predictive factors for increased mortality.

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