Neurology Asia 2013; 18(2) : 131 – 135

ORIGINAL ARTICLES

Predicting mortality rate with ICH score in Thai intracerebral hemorrhage patients

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Abstract

Intracerebral hemorrhage (ICH) constitutes 10% to 15% of all stroke patients. ICH score is a simple tool for outcome prediction for intracerebral hemorrhage patients. The score consists of 5 characteristics including age > 80 years, Glasgow Coma Scale, infratentorial location, hematoma volume and presence of intraventricular hemorrhage that were found to be independent predictors of poor prognosis. The study aimed to validate prediction of 30 days mortality in Thai intracerebral hemorrhage patients**.** This is a cross-sectional study of patients with ICH in Thammasat University Hospital from 1 January 2011 to 31 December 2011. Independent predictors of 30 days mortality were identified and the ICH score was determined. The study showed that the significant independent parameters were location of hemorrhage, Glasgow Coma Scale, and ICH volume. In multivariate analysis, the significant parameters were infratentorial ICH, Glasgow Coma Scale (3-4), ICH volume $\geq$ 30 cm^3, and presence of intraventricular hemorrhage. We conclude that ICH score is a useful and reliable tool to predict 30 days mortality in Thai patients, although age > 80 years is not an independent predictor in this study.

INTRODUCTION

Intracerebral hemorrhage (ICH) accounts for 10 to 15% of patients who present with acute stroke.[1,2] Morbidity and mortality caused by ICH are high.[3-5] There has not been reduction of the mortality rate of ICH in the recent decades.[4,6] Overall mortality also seems to be similar in all regions of the world.[4] The mortality rate of patients with ICH at 30 days varies from 13 to 61%.[4,5,7,8] There are many models for prediction the outcome after intracerebral hemorrhage.[8,9] Among the predictive models, ICH score is the most popular, due to its simplicity and accuracy.[4,10] The score consists of 5 characteristics: Age > 80 years, Glasgow Coma Scale (GCS), infratentorial location, hematoma volume and presence of intraventricular hemorrhage.[10] Each characteristic is an independent predictor of mortality at 30 days after onset of stroke. This simple ICH score has been validated in different populations, including the Asians.[11-14] However, there is no validation of ICH score in Thai population. In this study, we validate each characteristic of ICH score as an independent predictor of outcomes and correlate the score with 30-day fatality in a Thai ICH cohort.

METHODS

Medical records of patients with spontaneous ICH at the Thammasat University Hospital admitted between 1st January and 31st December 2011 were reviewed. All variable used in ICH score was obtained from initial presentation at emergency room such as blood pressure, Glasgow Coma Scale, presence of intraventricular hemorrhage, and ICH volume in milliliters. The GCS score at the time of transfer from the Emergency Department was used. ICH volume was measured on the initial head CT scan with the use of the ABC/2 method. In which "A" is the greatest diameter in centimeters on the largest hemorrhage slice, "B" is the diameter perpendicular to "A", and "C" is the approximate number of axial slices with hemorrhage multiplied by the slice thickness in centimeters. The presence or absence of intraventricular hemorrhage on initial CT brain was also noted. Other parameters obtained included age, sex, past medical co-morbidity, site and size of hemorrhage, and surgical intervention. Outcome was assessed as mortality at 30 days after ICH.

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RESULTS

Sixty-six patients with ICH patients were identified (Table 1). Overall mortality rate was 18% (n=12). Mean age of those who died were 67 years (range, 31 to 88 years). Males accounted for 63.6% of the overall ICH patients, and mortality of the males was 66.7%. The locations of ICH were basal ganglia (48.5%), lobar (25.8%), infratentorial (15.2%), combined supra and infratentorial (7.6%), and thalamic hemorrhage (3.0%). The mortality rate of each location was infratentorial (41.7%), basal ganglia (33.3%), lobar (16.7%), and thalamus (8.3%). The GCS at presentation was divided into 12-15 (62.1%), 5-12 (28.8%) and 3-4 (9.1%). Of the 12 patients who died, their GSC were 12-15 (6 patients, 50%), 5-12 (3 patients, 25%), and 3-4 (3 patients, 25%). Most patients had ICH volume of less than 30 ml (62.1%), which accounted for 33.3% of total mortality. Thirty two patients (48.5%) had associated intraventricular hemorrhage. Eleven out of 12 (91.7%) patients who died within 30 days had intraventricular hemorrhage. Hypertension was the most common pre-existing diseases (37.9%). Systolic blood pressure at presentation was divided into more than 200 mmHg (53.0%), 140-200 mmHg (39.4%) and less than 140 mmHg (7.6%). Half of the patients who died within 30 days presented with systolic blood pressure of more than 200 mmHg.

Table 1: Univariate analysis of parameters predictive of mortality of ICH patients by 30 days (n=66)

Patient characteristic		n (%)	30-day Mortality, n (%)	*P*
Sex				
	Male	42 (63.6)	8 (66.7)	0.809
	Female	24 (36.4)	4 (33.3)	
Location				
	Lobar	17 (25.8)	2 (16.7)	0.034*
	Basal ganglia	32 (48.5)	4 (33.3)	
	Thalamus	2 (3)	1 (8.3)	
	Infratentorial	15 (22.8)	5 (41.7)	
Age ⩾ 80 y				
	Yes	31 (47)	7 (58.3)	0.383
	No	35 (53)	5 (41.7)	
Presence of IVH				
	Yes	32 (48.5)	11 (91.7)	0.001*
	No	34 (51.5)	1 (8.3)	
Systolic blood pressure (mmHg)				
	<140	5 (7.6)	2 (16.7)	0.414
	140-200	26 (39.4)	4 (33.3)	
	>200	35 (53)	6 (50)	
GCS				
	Score 3-4	6 (9.1)	6 (50)	< 0.001*
	Score 5-11	19 (28.8)	3 (25)	
	Score 12-15	41 (62.1)	3 (25)	
ICH volume (ml)				
	<10	24 (36.4)	1 (8.3)	0.041*
	10–30	17 (25.8)	3 (25)	
	>30	25 (37.9)	8 (66.7)	
Surgical treatment				
	Yes	23 (34.8)	7 (58.3)	0.059
	No	43 (65.2)	5 (41.7)	

*significant $p < 0.05$

ICH, intracerebral hemorrhage; GCS, Glasgow Coma Scale

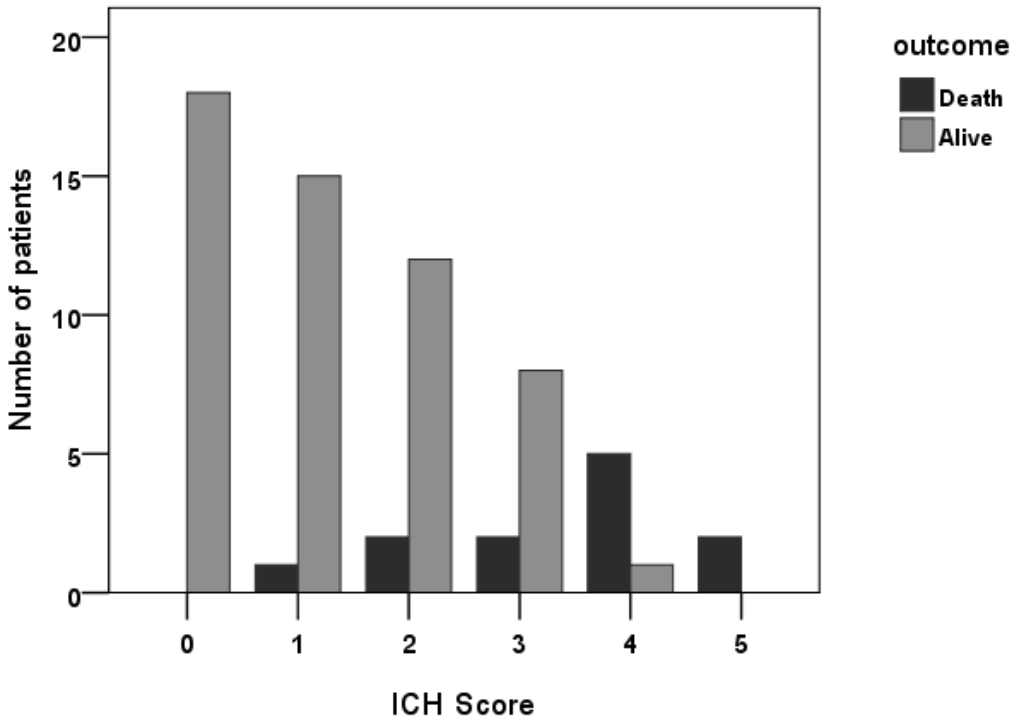

Figure 1 Correlation between death/survival at 30-Day and ICH score. The odds ratio of mortality outcome compared between higher score (≥ 4) and lower score was 7.3 (95% CI 1.17 – 45.8).

All patients with ICH score 0 (n = 18, 27.3%) survived at 30 days. Patients with ICH score 1 (n = 16, 24.2 %), ICH score 2 (n = 14, 21.2 %), ICH score 3 (n = 10, 15.2%) and ICH score 4 (n = 6, 9.1%) had mortality rate of 8.3%, 15.2%, 16.7% and 41.7%, respectively. Only two patients (3%) had ICH score 5 and both patients died. No patient had ICH score of 6. The correlation between the ICH Score and 30-days mortality was shown in figure 1. As shown, increasing ICH score correlated with increasing mortality at 30 days. The odds ratio of mortality of patients with higher ICH score of ≥ 4 as compared to lower score was 7.3 (95% CI 1.17-45.8).

In univariate analysis, the significant variables associated with mortality were location of hemorrhage (p = 0.005), Glasgow Coma Scale (p < 0.001), and ICH volume (p = 0.023). Non significant variables were age > 80 years (p = 0.383), systolic blood pressure (p = 0.426), and gender (p = 0.809). In multivariate analysis, odds ratio of significant parameters is shown in Table 2, which includes infratentorial hemorrhage, GCS (3-4), ICH volume > 30 cm^3, and presence of intraventricular hemorrhage.

DISCUSSION

Clinical grading score is an important tool for physicians in evaluation and management of patients with ICH.[7] The widely used clinical grading score for predicting 30 days mortality rate and further management in patients with ICH include the popular and simple to use ICH score. The ICH score has been validated in various regions in Asia, including Taiwan, Malaysia and Philippines.[12-14] Yousuf *et al*. from Malaysia also showed that the significant predictors of mortality in ICH to be low GCS, posterior fossa bleed, hematoma volume >60 ml, and intraventricular hemorrhage, consistent with the parameters of the ICH score.[15] This study was an attempt to validate the ICH score in Thai patients.

ICH score comprises of 5 parameters to predict the clinical outcome, including GCS, infratentorial location, presence of intraventricular hemorrhage, age, and ICH volume. The total ICH score is the sum of points in each parameter.[8,10] Our study has confirmed that the higher ICH score was associated with higher mortality as in previous study.[10] ICH Score ranges from 0-6. In our study, no patient with ICH score 0 died, whereas all patient with score 5 died. The patients with ICH score of ≥

Table 2: Multivariate analysis of factors predictive of mortality of ICH patients by 30 days

Patient characteristic	Odds ratio (95% CI)	*p*
Location of ICH (Infratentorial only)	4 (1.58-10.13)	0.005*
GCS (3-4)	10 (4.68-21.36)	< 0.001*
ICH Volume (≥ 30 cm^3)	3.3 (1.10-9.78)	0.023*
Presence of intraventricular hemorrhage	11.69 (1.59-85.4)	0.001*

*significant with $p < 0.05$
ICH, intracerebral hemorrhage; GCS, Glasgow Coma Scale

4 had higher mortality compared to those with lower scores, with odd ratio of 7.3.

Based on the multivariate analysis, the parameters in the ICH score that was significantly associated with 30-days mortality in our study were presence of intraventricular hemorrhage (OR 11.69), GCS 3-4 (OR 10), infratentorial hemorrhage (OR 4), and ICH volume ≥ 30 cm^3 (OR 3.3).

On the other hand, age > 80 years, gender, and systolic blood pressure were not associated with high mortality. Age > 80 years is an independent predictor of mortality in the original study of the ICH score.[10] Older age is also an independent predictor of poor outcomes in many other studies.[4,5,9] The lack of association between age > 80 years and mortality in our study may be due to small patient number.

Surgical treatment was also not significantly associated with mortality in our study. This lack of benefit is consistent with the findings from the randomized trials of surgical management for ICH.[16-18]

In conclusion, other than age > 80 years, we confirmed the association of the parameters in ICH score with mortality at 30 days in this cohort of Thai patients.

ACKNOWLEDEMENT

This study was supported by the National Research University Project of Thailand Office of Higher Education Commission.

DISCLOSURE

Conflicts of interest: None

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