

Review Article

Predicting of mortality in patients with intracranial hemorrhage: A review article

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Abstract

Introduction: Stroke is one of the important and common diseases, which can lead to permanent disability or even death to people. Intracranial hemorrhage (ICH) is a type of stroke that is associated with high mortality despite improved diagnostic and treatment methods, as well as the mortality rate remains high.

Methods: In the present review article, reputable internet databases since 2000 were analyzed. Studies that discussed the predicting mortality of ICH were included in this review.

Results: For predicting the mortality rates in patients with primary ICH, physicians use several methods such as level of consciousness, bleeding volume and multiple rating systems. In this review, we introduce three scoring system of ICH in patients with ICH.

Conclusion: Perhaps its cut-off point of these three score systems were different in different societies according to conditions and facilities therefore it is needed to review these scores and record their results in different societies.

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Introduction

The Stroke meaning is the decreased blood flow to an area of the brain leading to neurological dysfunction, specifically related to the affected area. About 87% of all strokes are caused by blockage of blood flow, which may lead to ischemic stroke. The 13% remaining is due to the rupture of the vessel wall, leading to bleeding into the brain parenchyma intracranial hemorrhage (ICH) or sub-arachnoid membrane (SAH). Stroke is the third leading cause of death and long-term disability among the population of the United States.

Mortality rates for ischemic stroke are approximately 10-5% and for cerebral hemorrhage is 60-40%. Only 10% of stroke

patients will be fully recovered. The rest of them, usually, will have mild to severe disabilities that are in need of physiotherapy measures. ICH can be primary or secondary (e.g., due to trauma). 10.5% of all acute strokes will include primary ICH and 30-day mortality rate is more than 50%.¹ 7-day mortality is 30%, 1-year is 55% and 10 year is about 80%.² Given the poor prognosis for most patients, their families are faced with the situation that they consent to the discontinuation of the treatment process.

It is identified that bad prognosis of patients is associated with non-cardio and lack of special care.^{3,4} With greater understanding of the pathophysiology of

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ICH, treatment options for this devastating disease remains limited.⁵ However, limiting treatment for patients with ICH is associated with increased short-term and long-term mortality and therefore it is recommend that doctors don't limit any treatments related ICH patients because it may exist chance of recovery.⁶ Two important reasons leading to vasculopathy ICH is hypertension (HTN) and cerebrovascular amyloid angiopathy.

Other causes include vascular malformation (AVM, aneurysm), drug toxicity (especially sympathomimetic such as cocaine), malignant HTN, tumors, saccular aneurysms, hematological dyscrasia, cavernous sinus thrombosis, ICH in patients with a history of ischemic stroke, tumors or moyamoya disease.^{1,2} The most common sites of bleeding in ICH induced HTN, is including putamen > thalamus > cerebellum > pons > other areas.²

The most common diagnostic technique of ICH is, using non-contrast computed demography (CT) scan of the brain, whereas magnetic resonance imaging is better able to identify underlying conditions, the use of a contrast agent can also determine the masses or aneurysms.^{1,2} Indicative symptoms of poor prognosis in ICH includes intra-ventricular hemorrhage (IVH), impaired consciousness on admission, and high blood loss is, usually, more than 40 cc.¹ Techniques used to measure blood volume is ABC/2, where A has maximum diameter of the bleeding in a stereotype cutting of a CT scan in cm, B has diameter perpendicular to A to the same stereotypical image of a CT scan in centimeters, C is the number of cuts in which bleeding is observed (the distance between the slices is typically 1 centimeter, but in some cases the distance between the slices is < 1 centimeter in the case the number of slices will be multiplied by the distance between them).¹ Treatment consists of supportive measures, control of blood pressure and blood drainage is needed for surgical consultation.^{1,2}

Results

ICH score

To assess and predict mortality in patients

with non-traumatic intracerebral hemorrhage numerous questions being raised, but one of simple and applied method is use of the ICH score. This score was calculated by using of primary advantage of a patient's level of consciousness on the Glasgow coma scale (GCS), blood volume (cm³), presence or absence of IVH, bleeding (supra or infratentorial), age (> or < 80 years) and the amount of mortality of patient's death in 1 month will be calculated (Table 1). The total scores vary between 0 and 6.⁷ Hemphill et al. for assessing mortality in patients with intracerebral hemorrhage using points ICH, conclude that using of this score is easy and applied and can predict the rate of mortality in the first time of visiting of patients as well therefore we can improve the treatment and caring methods by using of this score.⁷

Table 1. ICH score

Variable	Points
GCS score	
3-4	2
5-12	1
13-15	0
ICH volume (ml)	
> 30	1
≤ 30	0
IVH	
Present	1
Absent	0
ICH location	
Infratentorial	1
Supratentorial	0
Age (years)	
≥ 80 years	1
< 80 years	0

GCS: Glasgow coma scale; IVH: Intra-ventricular hemorrhage; ICH: Intracranial hemorrhage
30-Day Mortalities for Total ICH Scores (0 = 0%, 1 = 13%, 2 = 26%, 3 = 72%, 4 = 97%, 5 = 100%, 6 = estimated to be 100%)

New ICH score

Another way had been introduced for scoring non-traumatic intracerebral hemorrhage in patients. The variables in the new scoring system is including NIHSS (National Institutes of Health Stroke Scale) (0-10: 0 points), (11-20: 1 points) (21-40: 2 points), the initial temperature of the body

(≤ 36 °C: 0 points), (> 36 °C: 1 point), pulse pressure (< 60 : 1 point ≥ 60 : 0 points), presence of IVH (1 point) and SAH (1 points). In this system, a score of 3 or higher is associated with increasing of mortality and a score of less than 3 is associated with reducing of mortality rate.⁸

Modified ICH score

Modified ICH Score is a modified method of scoring with more points. In this systems Scoring in the level of consciousness on the GCS is different with ICH. The criteria and way of rating system are presented in table 2. In this system, in the case of presence of IVH, Graeb's score is used.⁸ Graeb's score is based on blood in the third and fourth ventricles and lateral left and right ventricles. The maximum score of this score is 12.

Scoring is then completely filling the lateral ventricles with score of 4, points comes low with less bleeding, third, and fourth ventricles of the full blood get a score of 2 (Figure 1).⁹

Cheung and Zou in their review on these three points conclude that use of these three systems are functional, comfortable and a good predictor of mortality in patients with ICH requirements.⁸ Jamora et al. on their review on Asian population conclude that using the ICH score well and accurately can show the mortality rate of patients with primary intracerebral hemorrhage.¹⁰

Godoy et al. in their study comparing the accuracy scores on the modified ICH with ICH concluded that both of these scores did not differ in predicting 30-day mortality but in predicting the performance of patients is better able to predict after 6 months of modified ICH score.¹¹ Muengtawepongsa and Seamhan in their review of assessing the accuracy of the ICH Score in Thai patients concluded that, this scoring have high value in predicting 30-day mortality in patients however, in their study of factors age over 80 years has not been proposed as an independent predictor.¹²

Table 2. Modified ICH score (A and B)

A		B	
Variable	Points	Variable	Points
GCS score		GCS score	
14-15	0	14-15	0
9-13	1	9-13	1
6-8	2	5-8	2
3-5	3	3-4	3
ICH volume (ml)		ICH volume (ml)	
< 30	0	< 30	0
30-50	1	30-50	1
> 50	2	> 50	2
IVH		IVH	
No	0	No	0
Yes	1	Yes	
Graeb's score		Graeb's score	
1-4	1	≤ 3	1
5-8	2	> 3	2
> 9	3		
Infratentorial origin		Infratentorial origin	
No	0	No	0
Yes	1	Yes	1
Age (years)		Age (years)	
< 50	0	< 65	0
50-64	1 (+1 = comorbidities)*	≥ 65	1 (+1 = comorbidities)*
> 65	2		
Total	0-11	Total	0-10

GCS: Glasgow coma scale; IVH: Intra-ventricular hemorrhage; ICH: Intracranial hemorrhage

*Medical comorbidities able to add 1 point are defined according to APACHE II score system

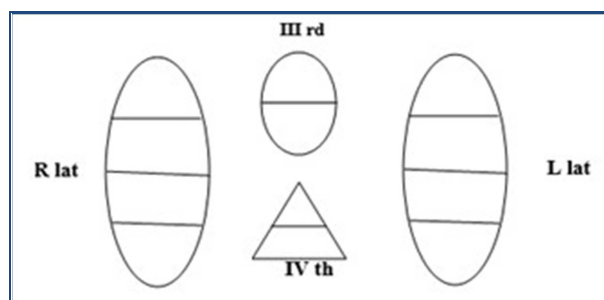


Figure 1. Graeb's score

Discussion

Various studies implies that the ICH scoring systems presented are a good predictor for 30-day mortality in patients with ICH requirements. Studies have shown that these 3 scoring systems were useful to predict mortality in patients with intracerebral hemorrhage and can take advantage from all of these 3 scoring systems for standardization

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of improving of patients caring and researching plans.

Conclusion

Maybe its cut-off point of these scores were different in different societies according to conditions and facilities therefore it is needed to review these scores and record their results in different societies.

Conflict of Interests

Authors have no conflict of interest.

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