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Clinical prognostic factors in patients with acute thalamic hemorrhage at Bach Mai hospital

Tran Bao Ngoc[1], Vo Hong Khoi[2], Pham Xuan Thang[3]✉, Pham Thi Ngoc Linh[2]

[1]19-8 Hospital

[2] Bach Mai Hospital

[3] Hanoi Medical University

Correspondence to

Pham Xuan Thang

Hanoi Medical University

Email: phamxuanthangtpv@gmail.com

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ABSTRACT

Objectives: To describe the clinical characteristics and identify selected prognostic factors in patients with acute thalamic hemorrhage at Bach Mai Hospital.

Subjects and Methods: This study included patients with spontaneous thalamic hemorrhage who were hosspitalized at the Department of Neurology, Bach Mai Hospital, from June 2022 to June 2023.

Results: Older patients (≥65 years) had a significantly lower rate of favorable progression compared to younger patients (<65 years) (OR = 0.21, 95% CI: 0.1-0.46). Mean systolic, diastolic blood pressure and body temperature were significantly higher in the unfavorable progression group ($p = 0.039$, $p = 0.004$, $p = 0.002 < 0.05$, respectively). Patients with a Glasgow Coma Scale (GCS) score of ≤8 at admission exhibited a significantly higher rate of unfavorable progression (86.67%) compared to those with a GCS score >8 (26.4%). The rate of unfavorable progression was significantly higher in patients with severe motor weakness (47.76%) compared to those with mild or no paralysis (19.18%). Patients without pupillary abnormalities were 8.86 times more likely to experience favorable disease progression compared to those with pupillary abnormalities.

Conclusion: Age, systolic blood pressure, diastolic blood pressure, temperature, Glasgow Coma Scale score, level of muscle strength, and pupillary abnormalities all showed statistically significant differences between the unfavorable and favorable progression groups.

Keywords: thalamic hemorrhage, clinical characteristics, prognosis.

I. INTRODUCTION

Thalamic hemorrhage accounts for approximately 8.3% to 15% of primary intracerebral hemorrhages.[1] The thalamus, located

in the diencephalon at the central region of the brain, is in close proximity to the lateral ventricles. Consequently, damage resulting from thalamic hemorrhage often affects both the brain parenchyma and the ventricular system (intraventricular hemorrhage). This results in a wide range of clinical symptoms and a complex clinical course. Alongside diagnosis and treatment, prognosticating the severity of intracerebral hemorrhage is crucial. Understanding the prognostic factors influencing clinical outcomes facilitates the implementation of more effective interventions to reduce morbidity and improve functional status in patients with intracerebral hemorrhage. Globally, numerous studies have investigated the clinical features, imaging characteristics, and prognostic factors of intracerebral hemorrhage in general, with some specifically focusing on thalamic hemorrhage. Many studies have demonstrated that the location of parenchymal hemorrhage is a strong determinant of clinical outcomes, and thalamic hemorrhage is particularly associated with increased mortality risk and poor patient prognosis.[2] In Vietnam, research on thalamic hemorrhage remains limited. Therefore, conducting in-depth studies on thalamic hemorrhage and its associated factors is essential. Given these considerations, to provide a comprehensive overview of thalamic hemorrhage, we conducted the study titled "**Clinical prognostic factors in patients with acute thalamic hemorrhage at Bach Mai hospital**."

II. SUBJECTS AND METHODS

2.1. Study Population

This study included all patients with spontaneous intracerebral hemorrhage who were admitted and received inpatient treatment at the Department of Neurology, Bach Mai Hospital, from June 2022 to June 2023.

2.2. Inclusion Criteria

Clinical Criteria

Age ≥ 18 years. Clinical diagnosis of intracerebral hemorrhage based on the World Health Organization (WHO, 1989) criteria for stroke: sudden onset of neurological deficits persisting for more than 24 hours or death within 24 hours, excluding traumatic causes.

Imaging Criteria

Brain CT scan confirming thalamic hemorrhage.

Time Criteria

Time from onset to hospital admission ≤ 72 hours.

Exclusion Criteria

Patients or their families declining participation. Thalamic hemorrhage due to: vascular malformations, coagulation disorders, severe liver failure, severe renal failure, severe heart failure, trauma, drug abuse; hemorrhagic transformation; and hemorrhage associated with a tumor. Patients without inpatient follow-up or incomplete medical records.

2.3. Study Design

Prospective, cross-sectional, descriptive study.

Sampling Method

Convenience sampling. A total of 140 patients meeting the inclusion criteria were selected. Patient's progression was categorized based on the modified Rankin Scale (mRS). Patients were subsequently divided into two primary groups: those with favorable progression, defined as an mRS score of 0-3, and those with unfavorable progression, corresponding to an mRS score of 4-6.

Data Analysis

Collected data were reviewed and analyzed using SPSS 20.0.

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III. RESULTS

3.1. Gender and progression of hemorrhage

***Table 1**. Gender and progression of hemorrhage*

Gender	Progression		OR	p
	Favorable (n, %)	Unfavorable (n, %)		
Female (N = 50)	33 (66)	17 (34)	0,923 (95% CI: 0,443-1,921)	p= 0,83
Male (N = 90)	61 (67,78)	29 (32,22)		

No significant difference was observed in disease progression rates between male and female patients (OR = 0.923, p = 0.83 > 0.05).

3.2. Age and progression of hemorrhage

***Table 2**. Age and progression of hemorrhage*

Age group	Progression		OR	p
	Favorable (n, %)	Unfavorable (n, %)		
≥65 (N = 66)	33 (50)	33 (50)	0,21 (95% CI:0,1-0,46)	p <0,001
<65 (N = 74)	61 (82,43)	13 (17,57)		

A statistically significant difference in hemorrhage progression was observed between the two age groups(p < 0.001). Older patients (≥65 years) had a significantly lower rate of favorable progression compared to younger patients (<65 years) (OR = 0.21, 95% CI: 0.1-0.46).

3.3. Vital signs at admission and progression of hemorrhage

***Table 3**. Vital signs at admission and progression*

Progression / Vital signs	Favorable	Unfavorable	p
Heart rate (bpm), mean±SD	85,65±10	87,09±10,33	0,509
Systolic BP (mmHg), mean±SD	156,55±18,13	166,72±28,67	0,039
Diastolic BP (mmHg), mean±SD	92,79±13,63	101,91±17,69	0,004
Body temperature (0C), mean±SD	36,91±0,47	37,15±0,48	0,002

Mean systolic and diastolic blood pressure were significantly higher in the worse progression group compared to the favorable progression group (p = 0.039 and p = 0.004 < 0.05, respectively). Temperature was also significantly higher in the worse progression group (p = 0.002 < 0.05). No statistically significant difference in heart rate as observed between the two groups.

3.4. Glasgow at admission and progression of hemorrhage

***Table 4**. Glasgow and progression of hemorrhage*

GCS	Progression		OR	p
	Favorable (n, %)	Unfavorable (n, %)		
≤ 8 (N=15)	2 (13,33)	13 (86,67)	0,06 (95% CI: 0,01-0,26)	p< 0,001
>8 (N=125)	92 (73,6)	33 (26,4)		

Patients with a Glasgow Coma Scale (GCS) score of ≤8 at admission exhibited a significantly higher rate of worse progression (86.67%) compared to those with a GCS score >8 (26.4%). This difference was statistically significant (p < 0.001).

3.5. Level of muscle strength and progression of hemorrhage

***Table 5**. Level of muscle strength and progression of hemorrhage*

Level of muscle strength	Progression		OR	p
	Favorable (n, %)	Unfavorable (n, %)		
No/Mild (3-5/5) (N=73)	59 (80,82)	14 (19,18)	3,85 (95%CI: 1,81-8,19)	p<0,001
Severe (0-2/5) (N=67)	35 (52,24)	32 (47,76)		

The rate of unfavorable progression was significantly higher in patients with severe group(47.76%) compared to those with mild/no group(19.18%). This difference was statistically significant (p < 0.001).

3.6. Pupillary abnormalities and progression of hemorrhage

***Table 6**. Pupillary abnormalities and progression of hemorrhage*

Pupillary abnormalities	Progression		OR	p
	Favorable (n, %)	Unfavorable (n, %)		
No (N=123)	90 (80,49)	33 (19,51)	8,86(95% CI:2,7-29,12)	p< 0,001
Yes (N=17)	4 (23,53)	13 (76,47)		

Patients without pupillary abnormalities were 8.86 times more likely to experience favorable disease progression compared to those with pupillary abnormalities. This difference was statistically significant (p < 0.001).

IV. DISCUSSION

In our study, we followed patients for 30 days from symptom onset. Among the 140 patients, 94 (67.14%) experienced favorable progression, characterized by recovering motor function and improved consciousness. 46 patients (32.86%) experienced poor progression, including 12 deaths. The overall mortality rate was 8.6%.

Table 1 demonstrates no significant difference in hemorrhage progression between the two genders. This finding is consistent with other studies on intracerebral hemorrhage in general and thalamic hemorrhage in particular.[3,4,5,6] In the poor progression group, a slightly higher

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percentage of female patients was observed compared to male patients (34% vs. 32.22%). However, this difference was not statistically significant (p = 0.83 > 0.05, 95% CI). This finding is consistent with studies by Dinh Thi Hai Ha, Lee, and Taek Min Nam, which also reported no significant gender-based differences in disease progression.[4,7,8]

Patients were categorized into two age groups: ≥65 years and <65 years. Results indicated a higher rate of unfavorable progression in the older age group (50%) compared to the younger group (17.57%). This age-related difference in progression was statistically significant (p < 0.001). These results align with findings from studies by Daniel Woo and Arboix.[3,9] Rost et al., in a study of 629 intracerebral hemorrhage patients, reported a 9.2-fold higher rate of favorable progression in patients <70 years compared to those ≥80 years.[10] Advanced age is a well-established predictor of poor outcome in intracerebral hemorrhage.

We performed univariate analysis on three vital signs (heart rate, blood pressure, and body temperature) at admission to evaluate their association with patient progression. The mean temperatures in the favorable and poor progression groups were 36.91±0.47°C and 37.15±0.48°C, respectively. The mean temperature was significantly higher in the poor progression group (p = 0.002 < 0.05). Numerous studies have indicated that elevated body temperature is a predictor of poor prognosis in patients. In Vi Quoc Hoan's study, hyperthermia (temperature >38°C) was associated with a worse prognosis compared to normothermia (temperature ≤38°C) and no fever (p<0.01).[11] Campos et al. reported that a maximum temperature ≥37.5°C within the first 24 hours was independently associated with poor outcomes in patients with intracerebral hemorrhage (OR = 4.29; 95% CI: 1.32–13.91; p = 0.015).[12] The relationship between hyperthermia and poor functional outcomes following intracerebral hemorrhage has been extensively documented in various studies.[13,14]

Our study revealed that systolic blood pressure at admission was higher in the poor progression group (166.72±28.67 mmHg) than in the favorable progression group (156.55±18.13 mmHg), and diastolic blood pressure was also higher in the poor progression group (101.91±17.69 mmHg vs. 92.79±13.63 mmHg). These differences were statistically significant (p < 0.05). In our study, many patients had received antihypertensive medication at home or at referring facilities prior to admission, which may have influenced our findings. Fogelholm et al., in a study of 452 patients with intracerebral hemorrhage confirmed by CT or autopsy, found that the most significant predictors of 28-day mortality were level of consciousness at admission and mean blood pressure during the first day. At all levels of consciousness, higher first-day blood pressure (especially mean blood pressure >145 mmHg) increased 28-day mortality.[15] Dinh Thi Hai Ha also reported that in patients with thalamic hemorrhage and intraventricular extension, systolic blood pressure was significantly higher in the deceased group.[8] Yasuo Terayama et al. also found that higher mean blood pressure at admission in patients with thalamic hemorrhage increased mortality.[16]

Numerous domestic and international studies have demonstrated that the Glasgow Coma Scale (GCS) score at admission significantly influences patient prognosis. We performed an analysis comparing two groups: patients with a Glasgow Coma Scale (GCS) score of ≥8 and those with a GCS score <8. The results

demonstrated that patients with a GCS score <8 had a significantly worse prognosis than those with a GCS score ≥8. This difference between the two groups was statistically significant (p < 0.001). The level of consciousness at admission is a strong predictor of outcome in intracerebral hemorrhage patients. Pham Thi Hai Ly's study found that patients with a GCS score ≤8 had a 17-fold higher risk of unfavorable progression compared to those with a GCS score >8.[6] Dinh Thi Hai Ha's univariate analysis showed that impaired consciousness, as assessed by the GCS score at admission, was associated with adverse outcomes in patients with thalamic hemorrhage and intraventricular extension (OR: 0.261, 95%CI: 0.144 – 0.474, p<0.001).[8] Rost et al. also reported that a GCS score ≥9 was associated with an 8-fold increase in the likelihood of favorable recovery (OR=8.0; 95% CI= 3.4-18.8; p<0.01).[10]

The results showed a significantly higher rate of worse progression in patients with severe motor paralysis (47.76%) compared to those with mild or no paralysis (19.18%). A statistically significant difference in patient progression was observed between the two groups with different levels of paralysis (p < 0.001). Thus, the degree of motor paralysis significantly influences patient prognosis. The mild/no paralysis group had a 3.85-fold higher rate of favorable recovery compared to the severe paralysis group (OR = 3.85; 95% CI: 1.81-8.19). Vi Quoc Hoan also reported that patients with severe paralysis had a worse prognosis than those with mild paralysis.[11] Dinh Thi Hai Ha's study found that severe paralysis was associated with unfavorable outcomes at 6 months in patients with thalamic hemorrhage and intraventricular extension (OR: 6.083, 95% CI: 2.041 – 18.129, p < 0.001).[8]

Our study demonstrated that patients with thalamic intracerebral hemorrhage and pupillary abnormalities had a higher rate of poor outcomes than those without pupillary abnormalities (statistically significant difference, p < 0.001, in univariate analysis, but not an independent predictor after adjusting for other factors). Pupillary abnormalities are recognized as a prognostic factor in numerous studies. This finding is consistent with Shad's study, which found pupillary abnormalities to be associated with poor outcomes in thalamic hemorrhage patients in univariate analysis, but not an independent predictor in multivariate analysis.[17] Mase et al., in a study of 138 patients with supratentorial spontaneous hemorrhage, reported that pupillary abnormalities were one of the eight significant predictors of 30-day mortality.[18]

V. CONCLUSION

Independent variables including age, systolic blood pressure, diastolic blood pressure, temperature, Glasgow Coma Scale score, level of paralysis, and pupillary abnormalities all showed statistically significant differences between the unfavorable and favorable progression groups.

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