CONCENTRATIONS OF S100B IN PATIENTS WITH ACUTE CEREBRAL INFARCTION AT INTENSIVE CARE UNIT OF HUE CENTRAL HOSPITAL

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Abstract:

Objectives: To survey S100B blood concentrations in patients with acute phase cerebral infarction. To understand the relationship between blood concentrations of S100B and a number of other risk factors such as age, gender, occupation, the coma state as measured by the Glasgow coma scale and the severity of lesions on computerized tomography. **Subjects and Methods**: The study examined 32 cerebral infarction patients hospitalized at intensive care unit of Hue Central Hospital. Data collection was conducted through medical records of patients with cerebral infarction. The study is cross-sectional and descriptive. Statistical analysis of the data was carried out using the SPSS 16.0 software**. Results:** The majority of patients were aged from 61 to 80 years-old (53.12%) and were elderly retirees. The association between S100B concentrations and age appeared to be positive, with higher concentrations found in older patients, but this relationship was not significant ($p > 0.05$). The concentrations of S100B also appeared to be highest for patients with Glasgow coma scale ratings of 7-9 (mean concentration=2.04 ± 2.68). Thus it appeared that the concentration increased with the severity of the coma state. However, the difference was not statistically significant ($p > 0.05$). There were six cases of S100B-positive but CT scan results were negative because the scans were taken too early (before 24 hours of injury). However there were two of 26 cases that produced a positive CT scan for cerebral infarction but not increased S100B. The larger the volume of brain lesions, the higher the concentration of S100B. There was a strong correlation between S100B concentration and lesion volume, with the following correlation equation: $y = 35.497x + 53.702$; and correlation coefficient: $r = 0.521$, $p < 0.01$. **Conclusion:** Increased blood concentration of S100B appeared earlier than positive computerized tomography in patients with acute-phase cerebral infarction. Patients in a deeper state of coma had increased S100β. The older a patient, the higher was the concentration of S100β. Age of patients was mostly between 61-80 years old (average 68.19 ± 13.29). Most were retired pensioners. There was a strong agreement on the correlation between S100β concentration and lesion volume.

Keywords: Stroke, Cerebral infarction, Glasgow Scale, S100B.

1. BACKGROUND

Cerebral vascular accident (stroke) is a matter of medical urgency in all nations and all peoples, regardless of age, gender and locality, perhaps because of its commonness and severe consequences. New diagnostic methods and modern drugs are highly effective

for early diagnosis, timely treatment and prevention, leading to improved prognosis [1], [2], [3].

In recent years, many research techniques have been developed to monitor stroke and predict the outcomes of treatment. Clinical neurological examination is useful for nerve function that may be compromised extensively but has little value in assessing the volume of cerebral infarction or the comatose condition of patients after the stroke. The diagnostic techniques of modern neuroscience such as CT, MRI and ultrasound help clinicians locate the volume of cerebral infarction and planning for treatment such as fibrinolytic drugs delivered intravenously or via arteries, and neuroprotective drugs to prevent destruction of brain parenchyma. However, it is unrealistic to repeat imaging studies every day [4], [5], [6], [7].

Recently authors have noticed a factor to help with the prognosis, monitoring and early diagnosis of cerebral infarction via lesions that are not seen on computerized tomography. S100B is a calcium acid binding protein (molecular weight 21 kDa) found in high concentrations in glial cells and Schwann cells. S100B exists in different forms depending on alpha and beta subunits. The beta subunit is very specific to brain cells. Beta-beta subunits are present in glial cells and astrocytes, while alpha-beta present only in glial cells but not in astrocytes, and also are found in muscle fibers, the heart and kidneys. S100B is metabolized in the kidneys and excreted in urine, with a biological half-life of approximately 2 hours. There are many S100 proteins, we studied only the S100B protein [8], [9], [10], [11], [12].

In Vietnam there has not been any previous research on this issue**.** Therefore, to better understand this issue, we studied the blood levels of S100B in acute cerebral infarction aiming to:

1. Survey S100B blood concentrations in patients with acute phase cerebral infarction.

2. Determine the relationship between blood S100B concentrations and some other risk factors such as age, sex, occupation, coma state measured by the Glasgow scale and the seriousness of injury as detected by computerized tomography.

2. MATERIALS AND METHOD

2.1. Subjects: 32 patients with cerebral infarction diagnosed by CT or MRI brain scan, treatment at the ICU of Hue Central Hospital in 2011.

2.2. Research Methodology: The study is cross sectional and descriptive.

Data collection method: Data collection was conducted through medical records of patients with cerebral infarction. S100B concentrations of blood was measured using immuning fluorescence polarization (FPIA = fluorescence Polarization Immunoassay) on the immunogenicity of automated Cobas 6000 at Hue Central Hospital. For assessment of S100B concentrations in the blood, normal values were as follows : 0.046 to 0.105 microgram / L(<0.105 microgram / L). [12]. Data was analysed using SPSS 16.0 software. Mean values were compared using t-tests.

3. RESULTS AND DISCUSSION

3.1. Common patient characteristics

Table 1: Characteristics of patients

Characteristics	Frequency (n)	Percentage (%)	p
Gender - male - female	 19 13	 59.37 40.63	>0,05
Age - ≤ 60 - 61-80 - > 80	 8 17 7	 25.01 53.12 21.87	>0,05
The average age	68,19±13,29 Min: 32; Max: 87		
Occupation - Officials - Trading - Retirement - old - Housework - Other jobs	 4 2 18 3 5	 12.50 6.25 56.25 9.38 15.62	<0,01
Geography - urban areas- rural areas	 16 16	 50 50	>0,05
Glasgow Coma Scale ≤ 6 points 7-9 points 10 -12 points > 12 points	 3 16 10 3	 9.38 50 31.24 9.38	<0,01
Total	32	100	

In our study, the proportions of men and women and people from urban versus rural areas were found to be statistically similar. The age of a majority of patients was from 61 to 80 years (53.12%) and most were retirees. Over half (52.6%) were rated as 7-9 on the Glasgow coma scale, i.e. relatively severe.

Table 2. The relationship between the Glasgow and the gender

Gender / Glasgow	Male		Female		p
	n	%	n	%	
≤ 6 points	0	0	3	23.09	>0.05
7-9 points	10	52.63	6	46.15	
10 - 12 points	8	42.10	2	15.38	
> 12 points	1	5.27	2	15.38	
Total	19	100	13	100	

The results in Table 2 show no statistically significant differences in Glasgow scale results between male and female patients.

3.2.Survey of S100B concentration

Table 3. Distribution S100B concentrations (ng/l) by Gender of cerebral infarction patients

Gender / S100 concentrations	male	female	generally	p
The average value	1.45±2.13	2.06±3.06	1.69±2.52	< 0.05

S100B concentration of males was higher than for female patients, but differences were not statistically significant (p> 0.05).

Table 4. S100B concentration distribution by age group of cerebral infarction patients

	Age group			p	Generally
	<60	60-80	>80		
S100B	1.59±3.41	1.64±2.13	1.93±2.65	>0.05	1.69±2.52

It appeared that S100B concentration increased in older age groups but the age groups were found to not differ significantly (p> 0.05).

Table 5. S100B concentration distribution according to Glasgow Coma Scale

	Glasgow Coma Scale				p	Generally
	≤ 6 points	7-9 points	10-12 points	≥ 12 points		
S100B	1.05±0.93	2.04±2.68	1.80±2.92	0.12±0,02	>0.05	1.69±2.52

The highest S100B concentrations were found in patients who scored 7-9 points on the Glasgow coma scale (2.04 ± 2.68). According to the above table, the more comatose patients generally showed increased S100B (although the difference was not statistically significant (p> 0.05)). This result was similar to those reported in other studies [9]. For example, Missler et al studied 44 patients with cerebral infarction and showed S100B concentrations correlated with the Glasgow Coma Scale (r = 0.51 p <0.001) [7], [8], [10]. Note that in the current study, there were only three patients who scored 6 or lower points on the Glasgow Scale and this small number may explain why S100B was not higher for this group.

Table 6. The relationship between S100B concentration and CT and MRI scan results

	First time, positive CT scan	First time, negative CT scan	Second time, positive CT scan	MRI Positive
S100B Positive	26	6	5	1
S100B Negative	2	0	0	0
Total	28	6	5	1

There were 6 positive cases of increased S100B that produced a negative result for cerebral infarction by computerized tomography. However, this was due to the fact that the CT scan was conducted early (less than 24 hours after injury). S100B also appeared early in studies conducted by other authors [13]. However, in this study there were 2 of 26 cases that achieved a positive first time CT scan for cerebral infarction but did not have increased S100B.

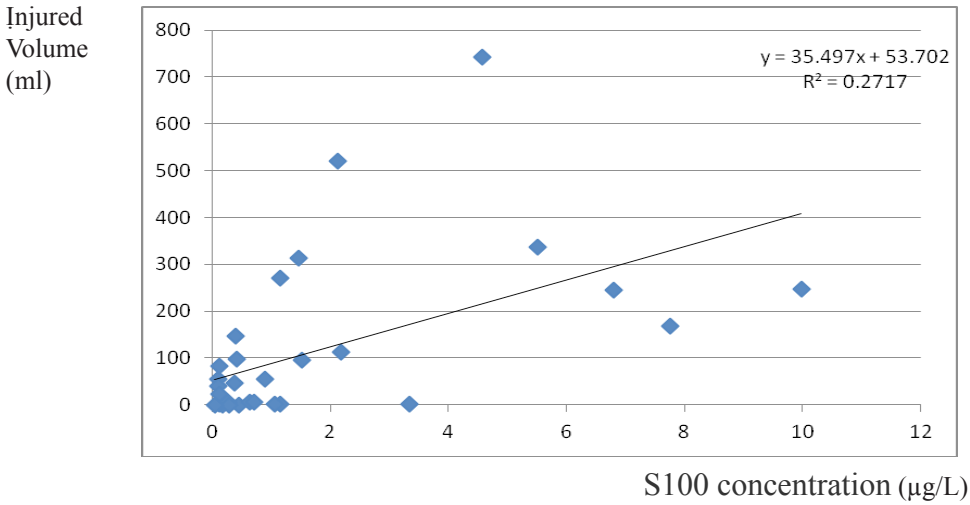

Figure 1. The correlation between the S100B concentration and volume of lesions

Figure 1 shows that the larger the volume of brain lesions, the higher the concentration of S100B. There was a statistically significant positive correlation between S100B concentration and volume of lesions. The correlation equation was: y = 35.497 +53.702 x, and the correlation coefficient was r = 0.521, p <0.01, similar to the results of other authors [5], [9]. For example, Missler et al studied 44 patients with cerebral infarction and showed S100B concentrations correlated with lesion volume (r = 0.75.p <0.001) [10]. Edward C. Jauch et al studied 359 patients with cerebral infarction and showed S100B concentration correlated with the volume of lesions on cranial CT scan (r = 0.239. p <0.0001) [7].

4. CONCLUSION

For patients with cerebral infarction in this study, increased S100B concentrations appeared earlier than positive computerized tomography scan results. More comatose patients showed increased concentrations of S100B. Older patients also had higher concentrations. In addition, there was a positive correlation between lesion volume and S100B concentration. It appears that S100B can be used to predict and monitor the volume of lesions on cranial CT scan and progressive diseases. Future study with larger numbers are needed to confirm these results.

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