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Correlation between stroke types, lesion location and degree under the background of aging

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Abstract: Objective: To explore the correlation between stroke types, lesion location and degree under the background of aging. Methods: 10ml venous blood samples were taken from all subjects at the time of admission, the third day and the seventh day after onset, and the levels of serum homocysteine (Hcy), whole blood C- reactive protein (CRP) and other biochemical indexes were detected. Serum S100β concentration was determined by immunochromatography, and PARK7 content was determined by ELISA. Results: The occurrence of stroke events was closely related to the degree of blood glucose, total cholesterol, low density lipoprotein, homocysteine, C-reactive protein and triglyceride, but not to the degree of high-density lipoprotein. The neurological deficit score in CI group showed that the more serious the disease was, the higher the plasma Hcy concentration was. There was no significant correlation between age and NHISS score. Conclusion: Plasma Hcy level in patients with acute stroke reflects the severity of their illness, which is helpful to evaluate prognosis and guide clinical treatment.

1. Introduction

Stroke is a frequently-occurring and common disease in neurology. At present, the death rate of stroke has leapt to the second place in the world and the first place in China, with the incidence of the elderly being the majority [1]. However, the pathological mechanism of stroke has not been fully clarified, and there is a lack of effective treatment. It has a high incidence, poor prognosis and high disability rate, which brings a heavy economic and spiritual burden to patients themselves, society and families [2]. Stroke is divided into ischemic stroke and hemorrhagic stroke, and the incidence of the former is significantly higher than that of the latter. With the aggravation of global population aging, the incidence of stroke is obviously on the rise in recent years.

Overweight and obesity are classic risk factors of cardiovascular disease, and the direct relationship between obesity and stroke is still in dispute. A number of foreign and domestic clinical studies show that [3-4], obesity and ischemic stroke have a significant positive correlation. However, the lifestyle of Chinese people is different from that of Caucasian people, and the research on the relationship between lifestyle and stroke risk is mainly in Caucasian people. At present, there are few related researches in China, and most of them are about smoking, alcoholism, high-fat and high-salt diet, while other researches are less. In recent years, clinical studies suggest that hyperhomocysteinemia is related to atherosclerosis and stroke, and is a new independent and important risk factor for stroke [5]. In this study, the plasma homocysteine (Hcy) content in 88 patients with acute stroke was measured, and its correlation with stroke type, lesion degree and lesion site was

analyzed, which provided theoretical basis for clinical prevention and treatment of stroke.

2. Materials and methods

2.1 General information

From January 2019 to March 2020, 88 stroke patients (stroke group) were hospitalized in our department, all of them met the clinical diagnostic criteria formulated by the National Conference on Cerebrovascular Diseases, and were confirmed by CT and/or MRI of the head, without heart, liver and kidney diseases. There were 56 cases of cerebral infarction (CI group), 35 males and 21 females, aged 42-80 years; There were 32 cases of cerebral hemorrhage (CH group), 26 males and 6 females, aged 37-75 years. In the control group, 30 physical examinees from the physical examination center of our hospital were normal in blood biochemistry, electrocardiogram, head CT, etc., excluding the history of cardiovascular and cerebrovascular diseases, hypertension, diabetes, thyroid diseases and hepatic and renal insufficiency, and normal in nervous system examination, including 17 males aged 38-77 and 13 females aged 43-75. There was no significant difference in age and sex between stroke group and control group.

2.2 Method

2.2.1 Specimen collection

Patients were admitted to hospital (within 24 hours of onset), 3 days and 7 days after onset, fasting venous samples were collected once, healthy people were collected once, 10ml each time, 4ml were placed in centrifuge tube, after blood samples were solidified, they were centrifuged for 20 minutes by high-speed centrifuge, and serum was extracted and stored in refrigerator at -80℃. 6ml was placed in heparin blood collection tube for inspection in routine and biochemical laboratory.

2.2.2 Serum Hcy detection

1ml of collected serum was sent to the laboratory, and the serum Hcy concentration was detected by Siemens RX automatic biochemical detector.

2.2.3 Cognitive function evaluation

Including consciousness level, orientation ability, concentration ability, language ability (comprehension, repetition and naming ability), spatial structure ability, memory ability, calculation ability, reasoning ability (similarity and judgment ability).

2.2.4 Evaluation of neurological deficit

The stroke patients in the stroke group were scored by trained neurologists according to NIHSS (National Institute of health stop scale) [6]. The NIHSS score ranged from 0 to 42, and the higher the score, the more severe the neurological deficit. 0 -1 means normal or slightly normal; 1 point -4 points mean mild stroke/small pawn; 5 points -15 points indicate moderate stroke; 15 points -20 points indicate moderate to severe stroke; 21 -42 points indicate severe stroke. The control group had no neurological deficit, and scored 0 points. Examiners should evaluate according to the actual situation, and pay attention to avoid training patients to make some efforts repeatedly as required [7]. According to the score of ≤20 or > 20, the patients were divided into mild to moderate group and severe group. Table 3 shows the grouping of different conditions of stroke group.

2.2.5 Whole blood CRP detection

Take out the reagent buffer from the cold storage environment and balance it to room temperature, about 25℃. Take out the ID chip from the kit, insert it into the chip port of the instrument, tear open

the aluminum foil bag of the test card, and take out the test card. Use a pipette to aspirate 8.5ul whole blood sample. Turn the whole blood sampler upside down, drop the first two drops of solution into the sampler cover, and ensure that there is no bubble at the sampling end, and then drop three drops vertically into the sampling hole of the test card. Take the used test card out of the instrument, and treat it with the excess buffer and pipette tip as infectious substances.

2.2.6 Statistical treatment

All the data were input into SPSS15.0 software package, the counting data were expressed by the number of cases or percentage, and the measurement data in accordance with the normal distribution were expressed by the "average value" ± Standard deviation "means that chi square test or chi square test was used for comparison between groups, $P < 0.05$ means the difference was statistically significant, $\alpha = 0.05$ is the test level.

3. Result

3.1 Comparison of blood glucose, blood lipid, homocysteine and C- reactive protein between stroke group and control group

Table 1: Comparison of blood glucose, blood lipid, homocysteine and C- reactive protein between stroke group and control group

Group	Blood sugar mmol/L	TC mmol/L	TG mmol/L	HDL-C mmol/L	LDL-C mmol/L	Hcy mmol/L	CRP mg/L
Stroke group	5.7(5.1-7.3)	6.7±0.5	2.2(1.3-2.7)	1.5±0.3	3.8±0.5	25.4(21.2-40.1)	14.6(11.6-26.8)
control group	5.1(4.4-5.7)	5.3±0.7	1.6(1.1-2.2)	1.3±0.3	3.2±0.6	11.2(8.9-14.6)	3.7(2.5-5.5)
P value	0.0005	<0.0001	0.0370	0.8802	<0.0001	<0.0001	<0.0001

Comparing the levels of blood glucose, blood lipid, homocysteine and C- reactive protein between stroke group and control group, it was found that the blood glucose of stroke group was 5.7(5.1-7.3) mmol/L, while that of control group was 5.1(4.4-5.7) mmol/L, with significant difference ($P < 0.01$). See table 1.

To sum up, the occurrence of stroke events is closely related to the degree of blood sugar, total cholesterol, low density lipoprotein, homocysteine, C-reactive protein and triglyceride, but not to the degree of high density lipoprotein.

3.2 Degree of neurological deficit and plasma Hcy content

Table 2: Comparison of plasma Hcy content between CI group and CH group in different degrees of illness (x±s, mmol/ L)

Group	Light	Medium	Heavy
CI group	23.6±10.2*	28.9±10.6**	36.7±10.4
CH group	18.5±10.3***	24.1±11.4***	31.4±10.7

Note: Compared with CI group, *t= 3.0570, P< 0.01;** t= 0.4417, P<0.01; Compared with CH group, *** t= 0.4157, P< 0.01

In CI group, 31 cases were mild, 12 cases were moderate and 13 cases were severe. CH group had 14 cases, 12 cases and 6 cases respectively. The more severe the disease, the higher the plasma Hcy concentration, as shown in Table 2.

3.3 Relationship between serum S100β protein concentration, serum PARK7 protein concentration, whole blood CRP concentration and serum Hcy concentration and NHISS score in stroke group

Table 3: Relationship between serum S100β protein concentration, serum PARK7 protein concentration, whole blood CRP concentration and serum Hcy concentration and NHISS score in stroke group

Index	Uncorrected		Corrected age	
	β±SE	P value	β±SE	P value
S100β24h	12.36±0.47	<0.0001	12.33±0.41	<0.0001
Park724h	1.38±0.02	<0.0001	1.45±0.05	<0.0001
CRP	0.86±0.02	<0.0001	0.82±0.05	<0.0001
Hcy	0.55±0.04	<0.0001	0.58±0.03	<0.0001

As shown in Table 3, the relationship between NHISS score and serum S100β protein concentration, serum PARK7 protein concentration, whole blood CRP concentration and serum Hcy concentration was statistically analyzed by linear regression. It was found that serum S100β protein concentration, serum PARK7 protein concentration, whole blood CRP concentration and serum Hcy concentration were positively correlated with NHISS score. Therefore, in clinical work, we can evaluate the degree of illness according to the serum S100β protein concentration, serum PARK7 protein concentration, whole blood CRP concentration and serum Hcy concentration, and guide clinical work. After age correction, there was no obvious change, that is, there was no obvious correlation between age and NHISS score.

4. Discussion

The brain is composed of left and right hemispheres, which are connected by calluses, with huge bundles of fibers between them. The outermost layer of the hemispheres is cerebral cortex, and the inner part is white matter, also called medulla. There are many gray matter nuclei in the medulla, namely basal ganglia. Both hemispheres are composed of frontal lobe, parietal lobe, temporal lobe, occipital lobe and insular lobe. There are many sulcus in each lobe, and the sulcus contains nerve centers with various functions, which forms the partition function of cerebral cortex.

In recent years, with the aging of the global population, the incidence of stroke has increased significantly, and there are more and more studies on stroke. Among them, the research on stroke biomarkers shows that stroke biomarkers can help us to diagnose stroke quickly, simply, economically, safely and effectively, guide the treatment of stroke and evaluate the prognosis. NHISS score is a scale used to evaluate the severity of neurological deficit in stroke. Literature [8] estimates the severity of clinical neurological deficit in stroke with the NHISS score at admission. The results show that the serum S100β protein value is consistent with the initial NHISS score, and the higher the NHISS score, the more significant the increase in serum S100β protein value. This study showed that the higher the NHISS score, the more obvious and longer the serum S100β and PARK7 protein concentration increased. With the improvement of the disease, the serum S100β and PARK7 protein concentration gradually decreased until it returned to normal. Generally speaking, serum S100β protein concentration and serum PARK7 protein concentration are positively correlated with NHISS score, which can be used as an auxiliary index of the severity of neurological deficit.

At present, quite a lot of data have shown that high plasma Hcy is a new risk factor for stroke [9]. However, a few literatures pointed out that high plasma Hcy has nothing to do with stroke [10]. In this study, the plasma Hcy content in stroke group was significantly higher than that in control group,

but there was no significant difference between CI group and CH group, which was consistent with the domestic and foreign reports, indicating that with the increase of plasma Hcy content, the risk of stroke increased, but the nature of the lesion could not be determined.

The lesion is located in pons, and it is easy to have the ability of living disorder: the lobe injury generally damages the ascending and descending nerve fibers partially, with mild symptoms and lighter prognosis than other lesions. The injury of basal ganglia can involve the internal capsule, which contains a large number of ascending and descending projection fibers. When the internal capsule is injured, it can show sensory and motor disorders, but it can be improved in a short time by training.

In terms of the severity of the disease, we found that the plasma Hcy level in patients with moderate and severe stroke was significantly higher than that in patients with mild stroke ($P<0.05$), indicating that the plasma Hcy level increased with the aggravation of the disease. Moreover, the changes of limb muscle strength and language disability left by patients with high Hcy after discharge are heavier than those with low Hcy, which indicates that the different plasma Hcy content also reflects the different outcomes, so the plasma Hcy concentration of patients with acute stroke is helpful to evaluate the prognosis.

5. Summary

To sum up, the higher the NHISS score, the more obvious the increase of serum S100β protein concentration and serum PARK7 protein concentration, and the longer the duration. With the improvement of the disease, the serum S100β protein concentration and serum PARK7 protein concentration gradually decreased until they returned to normal. Therefore, the two serum markers are of great significance to the early diagnosis of stroke. No matter whether the lesion is located in basal nucleus, brain lobe or brain stem, there is no significant difference in plasma Hcy level, which suggests that the vascular injury caused by Hcy is not selective.

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