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Study on the Correlation between Serum Homocysteine and Coagulation Function Indicators in Elderly Patients with Hypertension

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Abstract: *Objective:* To explore the relationship between serum homocysteine (Hcy) levels and coagulation function in elderly patients with hypertension. *Methods:* 50 elderly patients with hypertension admitted to our hospital from January 2022 to December 2023 were selected as research subjects. According to the patients' Hcy levels, they were divided into an observation group (high Hcy group, n = 21) and a control group (normal Hcy group, n = 29). Two groups of coagulation function indicators were detected, and the correlation between Hcy and coagulation function indicators was analyzed. *Results:* The prothrombin time of the observation group was shorter than that of the control group, and the fibrinogen level was higher than that of the control group. The differences were statistically significant ($p < 0.05$); the Hcy level was positively correlated with fibrinogen and negatively correlated with the prothrombin time. *Conclusion:* Abnormally elevated Hcy levels in elderly patients with hypertension may affect coagulation function, and the two are closely related. Clinical risk can be assessed by monitoring relevant indicators.

Keywords: Senile hypertension; Serum homocysteine; Coagulation function; Correlation

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1. Introduction

Hypertension in the elderly is a chronic disease with high clinical incidence, and the number of patients continues to increase with age. Poor disease control can easily induce serious complications such as cardiovascular and cerebrovascular diseases, posing a threat to the life safety of patients [1,2]. Serum homocysteine (Hcy) is a sulfur-containing amino acid, and its elevated level is regarded as a key risk factor for cardiovascular disease. It may affect disease progression through mechanisms such as damaging vascular endothelium and accelerating thrombosis. Abnormal coagulation function is the core link in the occurrence of thrombotic events. Elderly patients with hypertension are often accompanied by coagulation dysfunction, which increases the risk of adverse events such as myocardial infarction and cerebral infarction [3,4]. At present, the aging process of my country's population continues to accelerate, the prevalence of hypertension in the elderly continues to rise, and hyperemia is also common in the elderly. The combination of the two will further aggravate

the patient's risk of illness and make clinical diagnosis and treatment more difficult. However, current clinical research on the specific relationship between Hcy and coagulation function in elderly patients with hypertension still needs to be improved. Some studies have problems with small sample sizes or single detection indicators, making it difficult to fully reveal the intrinsic relationship and clinical significance of the two. Clarifying the relationship between the two can provide an important basis for disease risk assessment and intervention [5]. Based on this current situation, this study selected 50 patients with hypertension as the research subjects, grouped them according to Hcy levels to detect coagulation function, and specifically explored the correlation between Hcy and coagulation function. The purpose is to provide a reference for clinical optimization of the diagnosis, treatment and prognosis management of hypertension in the elderly, help reduce the probability of adverse events, and improve the long-term quality of life of patients.

2. Materials and methods

2.1. General information

Fifty elderly patients with hypertension admitted to our hospital from January 2022 to December 2023 were selected as research subjects. According to the patients' Hcy levels, they were divided into an observation group (high Hcy group, n = 21) and a control group (normal Hcy group, n = 29). The observation group included 12 males and 9 females, aged 60–78 (68.38 ± 4.06) years old; the control group included 16 males and 13 females, aged 61–79 (68.80 ± 3.96) years old. The basic data of the two groups are comparable, $p > 0.05$.

2.1.1. Inclusion criteria

(1) Meet the diagnostic criteria for hypertension in the elderly
(2) Age ≥ 60 years old
(3) Voluntarily participate in this study.

2.1.2. Exclusion criteria

(1) Combined with coagulation disorders
(2) Severe liver and renal insufficiency
(3) Recent use of drugs that affect coagulation.

2.2. Method

Both groups of patients collected 5 mL of venous blood on an empty stomach in the early morning. Before collection, the patients should be informed to avoid high-fat, high-protein foods and alcohol during dinner the previous day, and to maintain fasting for 8 to 12 hours, in order to reduce the interference of dietary factors on test results. When collecting blood, use disposable vacuum blood collection tubes and strictly abide by aseptic operation guidelines. After blood collection, gently invert the blood collection tube 5 to 8 times to allow the blood and anticoagulant to fully mix to prevent violent shaking that may cause red blood cells to rupture. Then put the blood collection tube into a centrifuge and centrifuge it at 3,000 rpm for 10 minutes. After centrifugation, the serum and plasma are quickly separated and stored in a refrigerator at minus 20 degrees Celsius. After all samples are collected, testing will be carried out intensively. The detection instrument used a fully automatic biochemical analyzer model of Beckman AU5800. Serum homocysteine was detected using the cyclic enzyme method, and the kit used was supplied by Beijing Leadman Biochemical Co., Ltd.; prothrombin time and activated partial thromboplastin time were detected by coagulation method, fibrinogen was detected by immunoturbidimetric method, and the coagulation function detection kit was provided by Shanghai Sun Biotechnology Co., Ltd. All testing operations are carried out in strict accordance with the kit instructions and instrument operating specifications. Each batch of testing is equipped with calibrators and quality control materials to ensure the accuracy and reliability of the test results. If the quality control results are abnormal, problems with the instrument, reagents, and

operations will be promptly investigated and the test will be performed again.

2.3. Observation indicators

Coagulation function indicators (prothrombin time, activated partial thromboplastin time, fibrinogen) were compared between the two groups, and the correlation between Hcy levels and various coagulation function indicators was analyzed.

2.4. Statistical methods

Data were analyzed using SPSS24.0. *t*-test for measurement data; χ^2 test for count data. $p < 0.05$ represents significant difference.

3. Results

3.1. Comparison of Hcy levels between the two groups

The Hcy level of the observation group was higher than that of the control group ($p < 0.05$). See **Table 1** for details.

Table 1. Comparison of Hcy levels between the two groups ($\bar{x} \pm s$, μmol/L)

Group	n	Serum homocysteine (Hcy)
Control group (Hcy normal group)	29	11.86 ± 2.15
Observation group (high Hcy group)	21	20.34 ± 3.26
t		11.088
p		0.000

3.2. Comparison of coagulation function indicators between the two groups

The prothrombin time of the observation group was shorter than that of the control group, and the fibrinogen level was higher than that of the control group ($p < 0.05$); there was no significant difference in the activated partial thromboplastin time between the two groups ($p > 0.05$). See **Table 2** for details.

Table 2. Comparison of coagulation function indicators between the two groups ($\bar{x} \pm s$)

Group	n	Prothrombin time (s)	Activated partial thromboplastin time (s)	Fibrinogen (g/L)
Control group (n = 29)	29	13.02 ± 1.28	35.68 ± 2.56	2.78 ± 0.42
Observation group (n = 21)	21	10.46 ± 1.15	34.92 ± 2.48	3.72 ± 0.54
χ^2		7.278	1.050	6.925
p		0.000	0.299	0.000

3.3. Correlation analysis between Hcy and coagulation function indicators

Correlation analysis showed that Hcy levels were positively correlated with fibrinogen ($r = 0.712$, $p < 0.05$), negatively correlated with prothrombin time ($r = -0.634$, $p < 0.05$), and had no significant correlation with activated partial thromboplastin time ($r = -0.235$, $p > 0.05$). See **Table 3** for details.

Table 3. Correlation analysis between Hcy and coagulation function indicators

Coagulation index	Correlation coefficient (r)	*p* value
Prothrombin time (PT)	-0.634	0.000
Activated partial thromboplastin time (APTT)	-0.235	0.108
Fibrinogen (FIB)	0.712	0.000

4. Discussion

Hypertension in the elderly is a chronic disease with high incidence, with complex pathological mechanisms and often accompanied by a variety of metabolic abnormalities. Hcy metabolic disorders and coagulation disorders are common pathological changes in the progression of the disease, and both have a very important impact on the prognosis of the disease. As an intermediate product of methionine metabolism, Hcy is maintained at a low level under normal physiological conditions. When key enzymes are lacking or the intake is insufficient during the metabolic process, its level will rise abnormally. Studies have confirmed that hyperhomocysteinemia can damage vascular endothelial cells, destroy the integrity of vascular endothelium, and promote platelet aggregation and thrombosis, thereby increasing the risk of cardiovascular and cerebrovascular complications [6]. Coagulation function indicators directly reflect the balance of coagulation and fibrinolysis in the body. Prothrombin time mainly reflects the function of the exogenous coagulation pathway. Fibrin is a key protein in the coagulation process. Increased levels can enhance blood coagulation and promote thrombosis.

The data of this study showed that the Hcy level of the observation group was higher than that of the control group, and the difference between the groups was statistically significant. This result is not only consistent with the basis for group setting, but also suggests that hyper-Hcyemia occurs in a certain proportion of elderly patients with hypertension. This phenomenon may be related to the unreasonable diet of elderly patients with hypertension and the decline in digestion and absorption capacity, resulting in insufficient intake or absorption of essential nutrients for Hcy metabolism such as folic acid and vitamin B12, which in turn leads to an abnormal increase in Hcy levels. At the same time, hypertension itself can cause damage to the vascular endothelium, interfere with the Hcy metabolism process, and further promote its level to rise. Hyper-Hcyemia is not only a concomitant manifestation of hypertension in the elderly, but may also participate in disease progression through various pathways and aggravate the degree of vascular damage [7].

The comparison results of coagulation function indicators showed that the prothrombin time of the observation group was shorter than that of the control group and the fibrinogen level was higher than that of the control group. The difference between the groups was statistically significant. This shows that the coagulation function of elderly hypertensive patients with hyperemia is significantly abnormal, and the blood coagulation ability is significantly enhanced, which greatly increases the risk of thrombosis. An in-depth analysis of the mechanism revealed that the interference of high Hcy on coagulation function involves multiple links and pathways, among which vascular endothelial cell damage is the core starting link. Hcy can generate a large number of reactive oxygen species through its own oxidation. These substances can directly attack the lipid bilayer structure of vascular endothelial cells, destroy the integrity and stability of the endothelial cell membrane, and cause endothelial cell dysfunction and even apoptosis. Damaged endothelial cells will lose their normal anticoagulant effect and instead abnormally release tissue factor. Tissue factor is a key initiating factor of the exogenous coagulation pathway. Its large release can quickly activate the exogenous coagulation cascade, accelerate the conversion of prothrombin to thrombin, thereby shortening the prothrombin time, and promote the cross-linking of fibrinogen to form a fibrin clot. At the same time, high Hcy can promote the liver to synthesize and secrete fibrinogen by regulating the expression of related genes in the liver, causing the fibrinogen level in the plasma to significantly increase [8]. On the other

hand, high Hcy can also enhance the activity of glycoprotein receptors on the platelet membrane, promote platelet adhesion and aggregation to form platelet thrombus, and elevated fibrinogen can further strengthen platelet thrombus and accelerate the maturation and development of thrombus. The activated partial thromboplastin time mainly reflects the functional status of the endogenous coagulation pathway. In this study, there was no significant difference in this index between the two groups. This may be because the effect of Hcy on coagulation function is pathway-specific and mainly works through the exogenous coagulation pathway. It has a relatively weak activation effect on factors XII, XII, etc. in the endogenous coagulation pathway, and the endogenous coagulation pathway of elderly patients with hypertension may be in a relatively stable compensatory state, which offsets the slight influence of Hcy to a certain extent.

Correlation analysis data shows that Hcy levels are positively correlated with fibrinogen and negatively correlated with prothrombin time, and the absolute values of the correlation coefficients are both high, indicating that the two are closely related. This result further confirms that there is a close internal relationship between Hcy and coagulation function indicators in elderly patients with hypertension. The higher the Hcy level, the higher the fibrinogen level, the shorter the prothrombin time, the stronger the blood coagulation ability, and the greater the risk of thrombosis. From a pathophysiological perspective, this correlation stems from the systemic disruption of coagulation-anticoagulation balance by Hcy. High Hcy not only directly affects the expression and function of coagulation indicators, but can also aggravate coagulation disorders through indirect pathways such as inflammatory response and oxidative stress, forming a vicious cycle of high Hcy-endothelial injury-coagulation activation-thrombosis [9]. The existence of this association allows Hcy to be used as an important reference indicator to evaluate the coagulation function status and thrombosis risk in elderly patients with hypertension, and can even become a potential intervention target. In clinical practice, by jointly monitoring Hcy and coagulation function indicators in elderly patients with hypertension, we can more accurately identify people at high risk of thrombosis and provide a basis for individualized intervention. For patients with elevated Hcy levels and abnormal coagulation function, targeted measures need to be taken on the basis of conventional antihypertensive treatment to break the above-mentioned vicious cycle: on the one hand, nutrients such as folic acid and vitamin B12 can be supplemented to promote the metabolic conversion of Hcy, reducing Hcy levels from the source and reducing damage to the vascular endothelium; on the other hand, antiplatelet drugs such as aspirin or low-dose anticoagulant drugs can be reasonably selected to inhibit platelet aggregation and thrombin activity, improve coagulation function, and reduce the probability of thrombosis. Especially for elderly hypertensive patients with other thrombotic risk factors such as diabetes and hyperlipidemia, more attention should be paid to the joint monitoring of Hcy and coagulation function, and intervention plans should be adjusted in a timely manner to effectively reduce the risk of serious cardiovascular and cerebrovascular complications such as myocardial infarction and cerebral infarction, and improve the quality of patient prognosis. In addition, this correlation also provides a convenient monitoring indicator for clinical evaluation of intervention effects. By dynamically observing changes in Hcy and coagulation function indicators, we can determine whether intervention measures are effective and optimize treatment plans in a timely manner to improve the accuracy and effectiveness of clinical diagnosis and treatment [10].

Overall, there is a close correlation between Hcy levels and coagulation function indicators in elderly patients with hypertension. Hyperhomocysteinemia can cause coagulation abnormalities and increase the risk of thrombosis. It is very necessary to monitor Hcy and coagulation function indicators in elderly patients with hypertension in clinical practice. It can provide an important basis for disease risk assessment and intervention, has a positive effect on improving patient prognosis, and is worthy of promotion and application in clinical practice.

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Disclosure statement

The author declares no conflict of interest.

References

[1] Bai R, Li Q, 2025, Study on the Relationship Between Coagulation Indexes, Homocysteine β2 Microglobulin Levels and the Occurrence of End-Stage Renal Disease in Patients with Hypertensive Nephropathy. Hebei Medicine, 31(5): 761–765.

[2] Lin J, 2024, The Diagnostic Value of Combined Measurement of Four Coagulation Parameters, D-D and Hcy Levels for Hypertensive Disease During Pregnancy. Practical Clinical Integration of Traditional Chinese and Western Medicine, 24(3): 82–85.

[3] Pu Y, Qin Y, Xu G, et al., 2023, The Diagnostic Value of Homocysteine Levels and Coagulation Index Testing in Patients with Cervical Cancer and Hypertension. Electronic Journal of Cardiovascular Diseases of Integrated Traditional Chinese and Western Medicine, 11(19): 73–75.

[4] Deng X, Zhong H, Lian L, 2022, Correlation Between Plasma Hcy Levels, Coagulation Factors, Arteriosclerosis and Ventricular Hypertrophy in Patients with H-Type Hypertension. Journal of North Sichuan Medical College, 37(8): 1022–1026.

[5] Lai X, Yang J, Liao S, 2022, Analysis of the Effect of Enalapril Maleate Combined with Folic Acid on Hcy and Coagulation Factors in Patients with Essential Hypertension. Heilongjiang Medicine, 35(1): 58–60.

[6] Li Y, 2022, Analysis of the Correlation Between Serum Homocysteine and Coagulation Function in Patients with Hypertension. Thrombosis and Hemostasis, 28(1): 50–51.

[7] Yan X, Shang J, Wang F, et al., 2022, The Relationship Between Homocysteine and Coagulation-Fibrinolytic Indicators and Cerebral Small Vessel Disease. Chinese Journal of Cerebrovascular Disease (Electronic Edition), 16(1): 27–31.

[8] Luo X, Zheng X, Zhang R, et al., 2021, Study on the Correlation Between Serum Homocysteine Levels and Coagulation Function in Patients with Hypertension Complicated by Atherosclerosis. Journal of Modern Laboratory Medicine, 36(3): 144–147 + 150.

[9] Li L, 2020, Correlation Analysis Between Serum Hcy and Coagulation Function in Patients with Hypertension. Inner Mongolia Medical Journal, 52(9): 1079.

[10] Jiang S, Ke J, Weng Q, 2019, The Clinical Significance of Coagulation Function and Plasma cTnI, Hcy, and PCT Levels in Evaluating the Severity and Prognosis of Cerebral Infarction in Patients with Acute Cerebral Infarction and Hypertension. Laboratory Medicine and Clinic, 16(19): 2889–2891.