

STUDY ON THE CORRELATION BETWEEN CRYPTOGENIC ISCHEMIC STROKE AND ATRIAL SEPTAL DILATATION TUMOR

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ABSTRACT

Objective: To analyze the correlation between cryptogenic ischemic stroke (CS) and atrial septal dilatation tumor.

Methods: A total of 55 patients who were diagnosed with ischemic stroke and no clear cause of etiology in our department of neurology from January 2016 to March 2019 were selected as the observation group, in addition, 55 patients of similar age excluding ischemic stroke were selected as the control group. The risk factors of cerebral ischemic stroke in the two groups were collected including coronary heart disease, diabetes, hypertension, smoking and drinking history, blood lipid level and other factors. Echocardiography was used to examine the presence of septal dilatation tumor in the two groups and to compare the incidence of septal dilatation tumor in the two groups. Logistic regression analysis of risk factors affecting CS occurrence.

Results: The detection rate of septal dilatation tumor in the observation group was 20.00%, which was significantly higher than that in the control group (3.64%, $P < 0.05$). The amplitude of atrial septal swing, right-to-left shunt at rest and right-to-left shunt ratio of contrast agents in the observation group were significantly higher than those in the control group ($P < 0.05$). In the observation group, the peak blood flow velocity and maximum pressure order difference of right and left atria were significantly higher than those of the control group, and the difference was statistically significant ($P < 0.01$). There was no statistically significant difference in the width of the foramen ovale blood stream between the two groups ($P > 0.05$). Logistic regression analysis results showed that among the risk factors of CS, the OR value of atrial septal dilatoma was 3.638, and 95% CI was 1.282~9.078, confirming that atrial septal dilatoma was a risk factor for the incidence of CS in young Chinese patients.

Conclusion: Atrial septal dilatation tumor plays an important role in the pathogenesis of cryptogenic ischemic stroke, and the change of early detection of atrial septal dilatation tumor in young and middle-aged patients is beneficial to the progress of clinical treatment of CS.

Keywords: Cryptogenic ischemic stroke, septal dilatation tumor, correlation.

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Introduction

Ischemic stroke is caused by sudden decrease or stop of local arterial blood supply in the brain tissue, resulting in ischemia, hypoxia and necrosis of the brain tissue in the arterial blood supply area, accompanied by clinical signs and symptoms of the corresponding sites. The incidence of stroke is increasing year by year, which places a heavy burden on patients and families⁽¹⁾. At present, there are more than 100 clinically known causes of stroke, but there are still 25%~39% ischemic stroke without a clear cause, which is called Cryptogenic ischemic stroke (CS). It occurs in most young and middle-aged patients (<55 years old), which brings great difficulties for patients

to choose treatment and prevention programs⁽²⁾. At present, it is believed to be related to congenital cardiovascular abnormality-patent foramen ovale septum, family genetic factors, paroxysmal atrial disorder, thrombocytopenic purpura, apnea syndrome and carotid artery dissection⁽³⁾. Some scholars have shown that the incidence of cryptogenic ischemic stroke in patients with atrial atrial fissure tumor is higher, and it is related to the size and activity of atrial septal expansion tumor⁽⁴⁾. Some foreign scholars have studied that simple atrial septal dilatation tumor can cause atrial arrhythmia, mural thrombus and so on, thus causing CS. However, it has not yet been concluded that there is no relevant report on this subject in China⁽⁵⁾.

Therefore, this study explored the correlation between CS and septal dilatation tumor, hoping to find out the new causes of CS and provide a theoretical basis for clinical treatment.

Data and methods

Research object

From January 2016 to March 2019, 55 patients who were diagnosed as ischemic stroke in the Department of Neurology of our hospital but did not find a clear cause were selected as observation group.

Enrollment criteria:

- According to the Diagnostic Criteria of Cerebral Infarction in the "Diagnostic Points for Various Cerebrovascular Diseases" revised by the Fourth Meeting of the Chinese Medical Association for Cerebrovascular Diseases, the patients were diagnosed as ischemic stroke patients⁽⁶⁾;

- Age ≤ 55 years old young and middle-aged patients;

- According to the World Health Organization WHO obesity latest guidelines for male BMI ≥ 30, female ≥ 29, Male BMI < 30 and female BMI < 29 patients were selected;

- Laboratory indicators are no abnormalities;

- Patients and the family informed consent and cooperated with the treatment, the study was approved by the hospital ethics committee.

Exclusion criteria:

- Has a clear cause of ischemic stroke;

- With severe liver and kidney dysfunction;

- Medical records incomplete statistics statisticians;

- Patients who did not receive echocardiography;

- History of atrial fibrillation, arrhythmia, cardiac surgery, etc.

In addition, 55 healthy patients excluded from the physical examination of ischemic stroke were selected as the control group, excluding the previous history of cerebral infarction.

Data collection

General clinical data of the two groups were collected, age, gender, height, weight, hypertension, diabetes, blood diseases and other diseases were recorded, body mass index (BMI) was calculated, head MRI, carotid artery ultrasound, cerebral artery CTA and platelet count, triglyceride (TG), blood glucose, blood routine and cholesterol were examined, and 12-lead electrocardiogram was performed. According to the diagnostic criteria of hypertension in the Chinese

guidelines for the prevention and treatment of hypertension, systolic blood pressure ≥ 139 mmHg and/or diastolic blood pressure ≥ 89 mmHg. Hyperlipidemia: triglyceride > 1.70 mmol/L, LDL cholesterol > 3.36 mmol/L; Total cholesterol > 5.72 mmol/L. Hyperglycemia: any blood glucose ≥ 11.1 mmol/L or fasting blood glucose ≥ 7.0 mmol/L.

Examination methods

Subjects in the left or supine position, echocardiography is mainly taken from the four-chamber view and the short-axis view of the large blood vessels, the main observations of the room septal expansion tumor are as follows: The location and size of septal dilatation tumor, the movement and wall thickness of dilatation tumor during normal respiration, and the relationship between dilatation tumor and intracardiac hemodynamics. Diagnostic criteria: Two-dimensional ultrasound showed partial or total atrial septum to one side of the atrium > 10 mm.

Statistical methods

Statistical analysis was performed using SPSS 17.0. Measurement data were analyzed by t test, count data were analyzed by χ^2 test, and multivariate analysis was performed by multiple regression analysis. To observe the age and gender distribution characteristics of cryptogenic ischemic stroke, and to analyze the correlation between possible multiple factors and cryptogenic ischemic stroke. $P < 0.05$ was considered to be statistically significant.

Results

Analysis and comparison of general data of the two groups

There were no statistically significant differences in age, gender, risk factors of ischemic stroke, including coronary heart disease, diabetes, hypertension, smoking and drinking history, and blood lipid levels between the two groups ($P > 0.05$). See table 1.

General data	Observation group (n=55)	Control group (n=55)	t (χ^2)	P
Age (years old)	45.60±7.24	44.77±7.87	0.576	0.566
Gender (Male/Female)	36/19	34/21	0.157	0.691
Hypertension	16	13	0.421	0.516
Diabetes	13	11	0.213	0.644
Coronary heart disease	9	7	0.293	0.589
Smoking History	20	19	0.040	0.842
Drinking history	21	16	1.018	0.313
Triacylglycerol	1.25±0.56	1.21±0.83	0.296	0.768
Total cholesterol	4.47±1.23	1.39±1.24	1.926	0.057
Low-density lipoprotein	2.69±0.73	2.43±1.03	1.527	0.130

Table 1: Comparison of general data between the two groups.

Comparison of two groups of echocardiographic results

The detection rate of atrial fissure tumor in the observation group was 20.00%, which was significantly higher than 3.64% in the control group ($P < 0.05$). The amplitude of the interatrial swing in the observation group, the right-to-left shunt at rest, and the right-to-left shunt of the contrast agent were obviously higher than the control group ($P < 0.05$), see Table 2.

Group	Cases	Room swing amplitude (mm)	Combined atrial fibrillation	Right to left shunt at rest	Contrast agent right to left shunt	Ascending aortic plaque
Control group	55	3.21±1.47	2 (3.64)	5 (9.09)	7 (12.73)	1 (1.82)
Observation group	55	6.27±1.78	11 (20.00)	17 (30.91)	22 (40.00)	3 (5.45)
<i>t</i> (χ^2)		9.830	7.066	8.182	10.536	1.038
<i>P</i>			0.008	0.004	0.001	0.308

Table 2: Comparison of two groups of echocardiographic results.

Differences between the parameters of the two groups of oval hole closure rate

The peak blood flow velocity of the foramen ovale and the maximum pressure gradient of the left and right atrium in the observation group were significantly higher than those in the control group ($P < 0.01$). There was no significant difference in the blood flow bundle width between the two groups ($P > 0.05$). See Table 3.

Group	Cases	Oval hole blood flow width (mm)	Peak blood flow velocity (cm/s)	Maximum left and right atrial pressure gradient (mmHg)
Control group	55	4.58±0.63	38.15±6.05	0.48±0.19
Observation group	55	4.79±0.48	64.35±19.24	1.93±1.37
<i>t</i>		1.966	9.634	7.775
<i>P</i>		0.052	<0.001	<0.001

Table 3: Comparison of the parameters of the two groups of oval hole closure rate ($\bar{x} \pm s$).

Logistic regression analysis of risk factors affecting CS

Logistic regression analysis showed that the OR value of atrial septal expansion tumor was 3.638 in CS risk factors, and 95% CI was 1.282~9.078, which confirmed that atrial septal expansion tumor is a risk factor for young CS patients in China. See Table 4.

Variable	OR Value	95% CI	<i>P</i> Value
Age	1.152	0.880~1.081	0.157
Gender	1.120	0.402~1.886	0.860
Septal dilatation tumor	3.638	1.282~9.078	0.008
Hypertension	1.255	0.527~2.812	0.311
Triglycerides	1.178	0.676~2.113	0.202
HDL	0.701	0.173~1.672	0.357
LDL	1.025	0.683~1.535	0.756

Table 4: Logistic regression analysis of risk factors affecting CS.

Discussion

Over the years, scholars at home and abroad have made various efforts to find the causes of young and middle-aged people with latent ischemic stroke, especially in recent years, and found some causes, such as family inheritance, patent foramen ovoid, thrombocytopenic purpura, carotid artery dissection, and apnea syndrome⁽⁷⁻⁸⁾. However, the incidence of implicit ischemic stroke is increasing, mainly occurring in young and middle-aged patients (< 55 years old), and there are still many patients who cannot find the cause, which brings some limitations for treatment and seriously threatens the quality of life of young and middle-aged patients. Some foreign scholars have reported that simple atrial septal dilatation tumor can cause atrial arrhythmia, mural thrombus and so on, and thus cause cryptogenic ischemic stroke, which has not been proved so far⁽⁹⁾. Domestic scholars have shown that atrial septal dilatation tumor with patent foramen ovalis can increase the incidence of cryptogenic ischemic stroke, but there is no report on whether simple atrial septal dilatation tumor can cause cryptogenic ischemic stroke⁽¹⁰⁾.

Atrial septal dilatoma is a balloon tumor caused by congenital atrial septal dysplasia, which expands to the hypotensive side under the influence of cardiac load factors. It is a rare deformity, which is mostly located at the level of the oval fossa of the atrial septum, rarely invading all the atrial septum, and self-repairing of the atrial septal defect under special conditions⁽¹¹⁻¹²⁾. The formation of septal dilatation tumor is related to the pressure difference in the left atrium and congenital septal endocardial connective tissue defect, which may exist alone or coexist with other heart diseas-

es. Small atrial septal dilatation tumors generally have little effect on hemodynamic changes of the body and can not be treated. Large atrial septal dilatation tumor can generally lead to hemodynamic disorder or concurrent with other cardiovascular diseases. When the dilatation tumor accumulates too much, it can block the lateral ventricle inflow tract to varying degrees, and it can also cause blood flow disorder and form scab, and embolus detachment can block the arteriovenous thrombosis⁽¹³⁾. In some cases, atrial arrhythmias may be caused by an increase in excitability of the ectopic pacemaker caused by a larger swell tumor. Due to the pressure difference between the left and right atria and the hemodynamic society of cardiac circulation, some people have mild atrial septal distension, but due to the small depth of the swelling, it is difficult to judge the atrial septal distension tumor clinically. Currently, there is no gold standard to diagnose atrial septal distension tumor⁽¹⁴⁾. Previous studies have found⁽¹⁵⁾ that atrial septal dilatoma is involved in the pathophysiological process of cerebral ischemia and peripheral arterial embolization, and it may lead to arterial embolization regardless of whether it is associated with other heart diseases. Foreign scholars found that⁽¹⁶⁾, 34.5% of stroke patients without other cardiogenic factors complicated with atrial septal dilatation tumor, and it can be an independent risk factor for clinical prediction of embolism disease. The related reason may be that septal dilatation tumor thickens and tends to adhere to platelets to form thrombus.

The results of this study showed that the detection rate of septal dilatation tumor in the observation group was 20.00%, which was significantly higher than that in the control group (3.64%, $P < 0.05$). The ratio of atrial septal swing amplitude, right-to-left shunt at rest and right-to-left shunt of contrast agent in the observation group was significantly higher than that in the control group ($P < 0.05$), which was consistent with the relevant foreign studies. The peak blood flow velocity of foramen ovale and the maximum pressure order of right and left atria in the observation group were significantly higher than those in the control group, with statistically significant differences ($P < 0.01$), suggesting that the increased pressure difference between right and left atria is one of the main reasons for the formation of septal dilatoma. Further Logistic regression analysis results of this study showed that among the risk factors of CS, the OR value of atrial septal dilatoma was 3.638, and its 95% CI was 1.282~9.078, confirming that atrial

septal dilatoma was a risk factor for the onset of CS in young Chinese patients. This suggests that for CS patients, in addition to active treatment, preventive treatment for risk factors should also be required.

In conclusion, atrial septal dilatation tumor plays an important role in the onset of implicit ischemic stroke, and the change of early detection of atrial septal dilatation tumor in young and middle-aged patients is conducive to the progress of clinical treatment of CS.

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