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Value analysis of plasma ANP level of reflection on cardiac structure and cardiac function changes of patients with ASD, VSD and PDA after interventional occlusion.

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Abstract

Objective: To observe plasma ANP level of patients with ASD, VSD and PDA after interventional occlusion, analyse plasma ANP level value of reflection on cardiac structure and cardiac function changes of patients with ASD, VSD and PDA after interventional occlusion.

Methods: 60 infantile patients with CHD were recruited into CHD group, right ventricular function was examined by UCG in the first and second day, first and third month after surgery. Plasma ANP expression level was detected by using ELISA. In addition, 30 healthy people by examination were recruited as NC group and were given relevant examination.

Results: Plasma ANP expression level by ELISA showed that compared with NC group, ANP level of infantile patients in various groups increased in different levels in the first day before surgery, the third day and first month after surgery (P<0.05-0.01). The third month after surgery was tending to be stable. There were no significant differences compared with NC group; compared with the first day before surgery, plasma ANP level obviously decreased the third day after interventional occlusion (P<0.05), it decreased in the first month and third month after surgery (P<0.01). UCG found that, compared with NC group, right ventricular volume in diastasis stage, right ventricular volume and right ventricular ejection fraction in end-systole period all significantly increased (P<0.05-0.01). In the third month after surgery, various indexes tended to be stable. There were no significant differences compared with NC group; compared with the first day before surgery, right ventricular volume in diastasis stage, right ventricular volume and right ventricular ejection fraction in end-systole period all obviously decreased in the third day after surgery (P<0.05); in the third and sixth day after surgery, right ventricular volume in diastasis stage, right ventricular volume and right ventricular ejection fraction in end-systole period obviously decreased compared with before surgery (P<0.01).

Conclusion: After interventional occlusion, plasma ANP level of infantile patients with ASD, VSD and PDA are detected, which is benefit for evaluating recovery conditions of heart structure and cardiac function in infantile patients.

Keywords: ANF, CHD, ASD, VSD, Patent ductusarteriosus, Heart function.

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Introduction

Congenital Heart Disease (CHD) is a malformation caused by heart growth defect or growth partial pause in parent body. It severely influences health of children and adult and has relatively high disability rate and death rate. In recent years, many studies show that Atrial Natriuretic Peptide (ANP) has close relations with heart function in adults. Its application has basically reached an agreement in medical field. But its value on CHD infantile patients still needs to be further study.

This paper is aimed at observing the Plasma ANP condition changes of CHD infantile patients after interventional occlusion by using ELISA, exploring change conditions of ANP and relations between heart function and heart function recovery and further identify plasma ANP level of value on

cardiac structure and cardiac function changes of patients with ASD, VSD and PDA after interventional occlusion.

Subjects and Methods

Study subjects

60 CHD infantile patients with interventional occlusion in cardiology department of our hospital from October, 2015 to January, 2017 were recruited into CHD group, consisting of 33 male infantile patients and 27 female infantile patients. Ages were from 3 to 15 y. Mean age was 7.12 ± 4.11. All patients were given UCG examination. The results showed that there were 25 ASD cases, 22 VSD cases and 13 PDA cases. Other 30 healthy patients by examination recruited as NC group, consisting of 16 male infantile patients and 14 female infantile patients. Ages were 3 to 14 y. Mean age was 6.93 ± 3.77 y. Sex and age of subjects in two groups given single factor ANOVA analysis. The results showed that there were no statistical differences (P>0.05). Detection results of liver, blood lipid and blood pressure kidney function of study subjects were normal. They had no cerebral infarction and malignant tumor etc. All subjects not took Warfarin drug etc. in recent three months. Clinical data of all subjects were complete. They all signed informed consent form. This study has been approved by ethics committee in our hospital.

Methods

Treatment methods of interventional occlusion in CHD group: The specific procedures as followed: first, giving anesthesia: infantile patients who were 10 y old or over given lidocaine for local anesthesia, below 10 given venous ketamine for general anesthesia. Second, interventional occlusion operation: ASD infantile patients given puncture by right femoral vein. Hand steel wire was placed into left upper pulmonary vein along femoral vein, then long sheath transported by stomodeum catheter along hard steel wire to left atrium. ASD with proper size (America AGA) occluder placed into left atrium under the guidance of UCG. Then occluder was released. VSD infantile patients were given right femoral vein and femoral artery puncture. To display size and location of VSD, angiographic catheter was placed through femoral artery for left ventricle angiography. Track from femoral vein to femoral artery was built by using super lubricious wire connecting with left ventricle. VSD with proper size (America AGA) occluder placed into left ventricle under the guidance of UCG. Then occluder was released. PDA infantile patients were given right femoral vein and femoral artery puncture. To display size and location of PDA, angiography given from angiographic catheter to origin of descending aorta through femoral artery, it was transported into stomodeum catheter along femoral vein until to descending aorta. PAD with proper size (America AGA) occluder placed into left ventricle under the guidance of UCG. Then occluder was released. Third, patients should lie in bed for 24 h after surgery and given ECG and blood pressure monitor for 24 h. Antibiotics were used from 3 to 5 d constantly.

Sample collection and detection methods: 120 ml elbow vein blood was collected in fasting state in the morning in the first day before surgery, the third day, first month and third month after surgery in CHD group. 120 ml elbow vein blood of healthy people was collected in fasting state in the morning in NC group. All blood samples were given pre-treatment according to requirements, and then placed in -70 e fridge for preparation. Plasma ANP expression level was detected by using ELISA. All operations followed the instruction of human plasma ANP kit (America. Abbott).

Measurement of UCG: America GE Vivid Five type color Doppler ultrasound flow detector was used. Probe frequency of setter was 1.7-3.5 MHZ. Observation subjects lying on ultrasound diagnosis bed quietly under room temperature were given location, formation and size of unclosed catheter measurement by chest ultrasound UCG in the first day before surgery, the third day, the first month, the third month after surgery by specially-assigned person. Then right ventricular volume in end diastole period and systolic function were detected by ultrasound. Average value after three cardiac cycles for constant measurement was fetched from all data.

Statistical methods: SPSS 17.00 Software was used to do statistical analysis. Measurement data were done with t test. Results were represented as mean ± SD. Statistical significance was assumed at P<0.05.

Results

Compared with NC group, plasma ANP expression level was detected by ELISA. It showed that ANP level of infantile patients in various groups increased in different levels in the first fay before surgery, the third day and the first month after surgery (P<0.05-0.01). The third month after surgery tended to be stable. There were no significant differences compared with NC group. UCG examination found that right ventricular volume in diastasis stage, right ventricular volume and right ventricular ejection fraction in end-systole period all significantly increased in the first fay before surgery, the third day and the first month after surgery (P<0.05-0.01). In the third month after surgery, various indexes tended to be stable. There were no significant differences compared with NC group. Compared with the first day before surgery, plasma ANP expression level of all infantile patients obviously decreased in the third day after occlusion (P<0.05), the first day and the third month after surgery further decreased (P<0.01). The detection results of UCG showed that right ventricular volume in diastasis stage significantly decreased in the third day after surgery (P<0.05). Right ventricular volume in end-systole period obviously decreased (P<0.05). Ejection fraction obviously decreased compared with before surgery (P<0.05). The detection results of UCG showed that right ventricular volume in diastasis stage, right ventricular volume and right ventricular ejection fraction in end-systole period in the third and sixth month after surgery significantly decreased compared

with before surgery (P <0.01). Details are shown in the Table 1.

Table 1. *Comparison of Right Ventricular (RV) volume, function and plasma ANP level in each group $\bar{x} \pm s$.*

Detection time	Right ventricular volume in end-diastole period (ml)	Right ventricular volume in end-systole period (ml)	Right ventricular ejection fraction%	ANP (pg.ml^{-1})
CHD group				
1 d before surgery	85.34 ± 11.31▲▲	55.98 ± 9.99▲▲	59.03 ± 10.09▲▲	198.66 ± 9.33▲▲
The 3 d after surgery	67.33 ± 13.12▲▲*	49.33 ± 10.12▲▲*	51.55 ± 13.3▲▲*	165.33 ± 8.99▲▲*
The 1 month after surgery	60.33 ± 9.78▲▲**	45.11 ± 8.99▲**	49.77 ± 12.1▲**	155.76 ± 9.77▲**
The 3 months after surgery	53.66 ± 8.98**	40.03 ± 7.34**	44.33 ± 7.12**	144.98 ± 9.88**
NC group	48.72 ± 6.88	37.33 ± 5.11	38.45 ± 6.12	137.60 ± 8.98

Note: ▲▲compared with NC group, P<0.01 in CHD various groups; ▲compared with NC group, P<0.01 in CHD various groups; **compared with before treatment, P<0.01 in various groups after surgery; *compared with before treatment, P<0.05 in various groups after surgery

Discussion

According to statistics, there are 5 to 10 CHD infantile patients in 1000 live births. CHD refers to infants have abnormal heart, vascular structure and function at the time of birth. Most infantile patients will die in infant period or childhood. Only about 5 to 15% can live until to adult period [1-4]. The relatively high incidence rate of CHD includes ASD, VSD and PDA. It mostly caused by rubella virus of their mother during pregnancy, thalidomide administration and long-time excessive drinking etc. It often accompanied with heart failure, growth dysfunction, cyanosis, infectious endocarditis, pulmonary infection and pulmonary arterial hypertension etc. during disease history, it brings great threat to life of infantile patients [5-9]. ANP is a neurological endocrine hormone of heart. It has been the study hotspot by many scholars since it has been founded. Human ANP exists in the form of α, β and γ. The strongest biological activity is α-ANP. β-ANP and γ-ANP may be the precursor of α-ANP. Butit's own has a certain biological activity [10,11]. There are studies showing that ANP receptor exits widely in general body. ANP exits in organs such as heart, vessels, kidney, lung, intestine, eye and kidney in different degrees [12]. Kenneth et al. [13] come up with arrhythmia and heart surgery can cause plasma ANP increase. ANP level is directly influenced by heart function. Relations between ANP and pulmonary arterial hypertension influenced by heart function. Sun et al. [14,15] studies show that plasma ANP and BNP level in patients with CHD has close relations with whether natriuretic peptide has deficits. But documents at home and broad on relations between plasma ANP level and heart function recovery conditions of CHD infantile patients before and after interventional treatment are still rare.

This study uses ELISA to detect plasma ANP level. Results show that ANP level of infantile patients in various groups increases in different levels in the first fay before surgery, the third day and the first month after surgery (P<0.05-0.01). The third month after surgery tends to be stable. There are no significant differences compared with NC group. It shows that plasma ANP level may has close relations with right ventricular volume and function. Comparing with the first day before surgery, plasma ANP expression level of infantile patients in the third day after occlusion surgery significantly decreases (P<0.05).The first month and the third month after surgery further decrease (P<0.01). It shows that interventional occlusion is an effective treatment method for treating CHD. With the prolong of rehabilitation after treatment, its plasma ANP level significantly decreases, it approaches to the normal level. This is in accordance with study results of Yu et al. [16,17].

In conclusion, change conditions of plasma ANP level has close relations with human heart structure and heart function recovery. After interventional occlusion, detecting plasma ANP level of infantile patients with ASD, VSD and PDA is benefit for evaluating recovery conditions of heart structure and heart function recovery of infantile patients.

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