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Observation of Kawasaki disease-related indexes and the study of relationship between myocardial enzyme changes and coronary artery lesions

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Abstract. – OBJECTIVE: To discuss the significance of Kawasaki disease-related laboratory indicators and relationship between myocardial enzyme changes and myocardial enzyme changes in children with Kawasaki disease.

PATIENTS AND METHODS: Make an observation of C-reactive proteins and immune globulin changes in children with Kawasaki disease, and also a comparison about the myocardial enzyme changes between the children with myocardial enzyme changes and others without lesions.

RESULTS: Compare the study group before treatment with the control group of normal children, there are significant differences in the levels of CRP, IgG, and IgM, and the difference was statistically significant ($p < 0.05$); make a comparison about the levels of AST, LDH, CK, HBDH, and CK-MB in the group with or without coronary artery lesions, the difference was not statistically significant ($p > 0.05$).

CONCLUSIONS: Relevant laboratory indices play an important role in the early diagnosis of Kawasaki disease. Myocardial injury and coronary artery lesions in children with Kawasaki disease have no correlation between each other, and there has an inconsistency characteristic.

Key Words:
Myocardial enzyme, Kawasaki disease, Coronary artery lesions.

Introduction

Kawasaki disease, also known as mucocutaneous lymph node syndrome (MCLS) (Compared to the children without coronary artery lesions, there has no significant difference[1-3] in MCLS)[4], is a kind of pediatric acute febrile rash disease that has a pathological feature about systemic vasculitis. The disease can affect infants and children, 80-85% disease has continued to rise around the world and took the top spot in pediatric acquired heart disease. The most important and serious lesions in Kawasaki disease is coronary artery lesion, which can cause coronary artery aneurysms, coronary artery stenosis, or even some severe complication and sequelae such as a sudden death[6-8]. Prevention and treatment of coronary artery disease is the most important target of Kawasaki disease treatment. In recent years, an increasing number of incomplete KD has been reported, the laboratory indices are the most important to diagnosis. Now there are no clear clinical signs and symptoms or laboratory test results can clearly suggest coronary artery disease[9-13]. We observed C-reactive protein (CRP) and immunoglobulins of children with KD in our hospital, and also measured serum creatine kinase to investigate the relationship between coronary artery lesion and children.

Patients and Methods

Patients

Thirty-two KD cases who received treatment in our hospital were selected between September 2009 and August 2011, the selected patients were consistent with the diagnostic criteria that were made in the Third International Conference of Kawasaki disease. There were 17 males and 15 females, age range from 5 month to 6 years old, the average is (2.9 ± 1.2) years old; 19 cases with coronary artery lesions and others have not. Meanwhile, we collected 32 healthy children that received normal physical examination in our pediatric outpatient department, 18 cases of male, 14 cases of female; children are from 7 months to 7 years old, the average age is (3.0 ± 1.4) years. There has no significant differences in age and gender between research group and control group, with comparable ($p > 0.05$).

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Methods

All enrolled children were taken fasting venous blood before and after treatment, immune nephelometry was used to detect the serum CRP and immunoglobulin (IgG, IgA, IgM); automatic biochemical analyzer (instrument for Siemens Dimension RXL MAX, Siemens, Berlin, Germany) was taken to detect myocardial enzyme levels such as aspartate aminotransferase (AST), lactate dehydrogenase (LDH), creatine kinase (CK), lactate dehydrogenase isoenzyme (HBDH), and creatine kinase isoenzyme (CK-MB).

Statistical Analysis

SPSS 16.0 software package (IBM, NY, USA) was used for statistical data analysis and statistical, numerical variable data were showed as mean ± SD ($x \pm s$), categorical variable data were expressed as a percentage; the comparison between the two mean by *t*-test, two-sample rate, or constituent ratio were compared using χ^2 test. Differences between the two groups were represented by the *p* value ($p = 0.05\%$).

Results

The comparison of CRP and Ig in two groups before and after treatment was shown in Table I. Comparing the before-treatment test group with the normal in terms of the CRP, IgG, and IgM levels, the difference had statistical significance ($p < 0.05$); when the test group was cured, made a comparison between the before and after treatment,the difference had statistical significance ($p < 0.05$).

The relationship between myocardial enzyme changes and coronary artery lesion was shown in Table II. As far as the levels of AST, LDH, CK, HB-DH, and CK-MB, there had been no significant difference found between the children with coronary artery lesion and others without that disease ($p > 0.05$).

Discussion

Kawasaki disease is now considered to be an immune-mediated systemic vasculitis that is triggered by superantigen, which is induced by a variety of pathogen in a susceptible host[14], the pathogenesis is not completely clear, clinical manifestations include fever, ball conjunctival hyperemia, polymorphous rash, lip and oral changes, symptoms of hands and feet, enlargement of cervical lymph nodes, etc.[15,16]. All changed are nonspecific, early diagnosis is restricted to some extent, the occurrence of coronary artery lesion will significantly improve if treatment delayed, and in recent years, reports showed that the incidence represents a trend of increase and not typical, which attracted public attention[17-20]. Who has fewer clinical symptoms and signs than diagnosis criteria is called incomplete Kawasaki disease, incomplete Kawasaki disease (IKD) incidence rate was account for about 13.8-26.2% of all children with KD according to literature reports[21-23], although clinical manifestations of IKD is atypical, its laboratory indices has no significant difference with typical Kawasaki disease[24,25] and, thus, laboratory indices has very important significance in early diagnosis of Kawasaki disease. This article observed CRP in children with KD. The results showed that the CRP levels between study group before-treatment and control group had differences, with statistical significance ($p < 0.05$). When cytokines, which are secreted by activated macrophages, stimulate and induce the hepatocytes, they produce acute phase protein, that is CRP, serum CRP levels have a close relationship with the degree of inflammation, it can combine with platelet-activating factor, which induces the platelet aggregation, granulocyte and monocyte activation, smooth muscle contraction. The epithelial cells excited and further cause increased vascular permeability and neutrophil margination, thereby, result in vascular

Table I. Comparison of CRP and Ig before and after treatment in children with Kawasaki disease cure ($\bar{x} \pm s$).

Groups	N	CRP (mg/L)	IgG (g/L)	IgA (g/L)	IgM (g/L)
Control group	32	5. 76 ± 1. 20	12.68 ± 4. 21	1. 95 ± 0. 56	1. 25 ± 0.56
Test group (before treatment)	32	22. 55 ± 7. 89[a]	17. 34 ± 6. 43[a]	2. 28 ± 0. 92	2. 41 ± 0.78[a]
Test group (after cured)	32	6. 95 ± 1. 65[b]	13. 67 ± 5. 1[b]	2. 16 ± 0. 77	1. 44 ± 0.78[b]

Note: Compared with the control group [a]$p < 0.05$, there was a statistically significant difference; compared with before treatment study group, [b]$p < 0.05$, the difference was statistically significant.

Table II. The relationship between the myocardial enzyme levels and coronary artery lesions in children with Kawasaki disease ($\bar{x} \pm s$).

Groups	N	AST (U/L)	LDH (U/L)	CK (U/L)	HB-DH (U/L)	CK-MB (U/L)
Coronary artery lesion group	19	47.97 ± 19.82	219.64 ± 57.88	232.31 ± 41.02	242.60 ± 30.83	32.60 ± 10.83
Coronary artery normal group	13	29.73 ± 10.87[c]	215.78 ± 47.54[c]	222.08 ± 40.93[c]	261.92 ± 40.81[c]	34.92 ± 10.81[c]

Note: Compared with the group with coronary artery lesion, [c]$p > 0.05$, there was no statistically significant difference.

inflammation. Thus, increased CRP levels represent the extent of the inflammatory response in acute stage of Kawasaki disease, also as a laboratory index to remind Kawasaki disease. Studies have shown that markedly elevated serum CRP had clinical significance in prompting Kawasaki disease with coronary artery lesions in patients[26-28].Our observations also showed that the study group before treatment compared with the control group had statistically significant differences in IgG and IgM levels ($p < 0.05$), indicated that the disease has significant immune disorders in the acute phase and plays an important role in the pathogenesis. Acute peripheral blood T-cell subsets imbalance, increased CD4, CD8 reduction, CD4/CD8 ratio increased. Such changes were most apparent in the lesion 3 to 5 weeks and returned to normal in 8 weeks.When CD4/CD8 ratio increased, the immune system was in a state of activation, lymphokines that secreted by CD4 were increased so that promote B-cell polyclonal water activation, proliferation and differentiation into plasma cells, resulting in the levels of IgM, IgA, IgG, IgE in serum increased. Excessive activation of immune cells produce a variety of cytokine-mediated pro-inflammatory and anti-inflammatory imbalance, which plays a key role in the occurrence, development, and coronary artery lesions in Kawasaki disease.

This article also made a comparison between the KD children with coronary artery lesions and KD children without the lesions in terms of myocardial enzymes including AST, LDH, CK, HB-DH, CK-MB and so on.

Conclusions

Results suggested that the difference between the two groups was not statistically significant ($p > 0.05$). This indicated that changes in myocardial enzymes levels do not represent the degree of coronary artery lesions in Kawasaki disease, not as a warning to prompt coronary artery damage either. The mechanism may be Kawasaki disease is an allergic vasculitis, inflammation, although involving the coronary arteries during the acute phase but no myocardial substantial involvement, which also verify that even severe Kawasaki disease in acute period of clinical there rarely will appear the signs and symptoms of heart function changes. Myocardial enzyme changes of children with Kawasaki have no correlation with earlier coronary artery lesions.

Conflict of Interest

The Authors declare that there are no conflicts of interest.

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