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Changes and clinical significance of liver function and myocardial zymogram in children with rotavirus enteritis

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ABSTRACT

Objective: To explore the changes and clinical significance of liver function and myocardial zymogram in children with rotavirus (RV) enteritis. **Methods:** A total of 70 children with RV enteritis who were admitted in our hospital were included in the study and served as the observation group. The liver function and myocardial zymogram before and after treatment were detected. The proportion of RV enteritis children with liver and myocardial damage was calculated. The effect of dehydration on the liver function and myocardial zymogram in children with RV enteritis was analyzed. A total of 65 children with non-RV enteritis who were admitted in our hospital at the same stage were served as the control group. **Results:** The serum ALT, AST, CK, CK-MB, LDH, and α-HBDH levels, and liver myocardial damage children proportion in the observation group were significantly higher than those in the control group (P<0.05). The serum ALT, AST, CK, CK-MB, LDH, and α-HBDH levels in the observation group were significantly elevated with the acceleration of dehydration degree (P<0.05). In the observation group, 45 children had liver and myocardial damage, whose ALT, AST, CK, CK-MB, LDH, and α-HBDH levels after treatment were significantly reduced when compared with before treatment (P<0.05). **Conclusions:** Early detection of liver function and myocardial zymogram can accurately reflect the condition in children with RV enteritis, which can provide an evidence for the formulation of clinical treatment protocol.

1. Introduction

Rotavirus (RV) enteritis is a diarrheal disease highly occurred in children in autumn and winter, and mostly occurred in infants aged from 6 to 24 months. RV is a main pathogen for developing enteritis, and about 40%-60% enteritis in children is caused by RV[1,2]. RV infection can cause systemic organic damage, including gastrointestinal tract, respiratory tract, and other organs, which can induce extraintestinal impairment, and cardiogenic shock or sudden death will occur in a severe condition[3,4]. Some researches demonstrate that RV infection can cause viral myocarditis and liver function damage in children[5,6]. The study is aimed to explore the changes and clinical significance of liver function and myocardial zymogram in children with RV enteritis.

2. Materials and methods

2.1. Clinical materials

A total of 70 children with RV enteritis who were admitted in our hospital from February, 2013 to April, 2016 were included in the study and served as the observation group, among which 37 were male, and 33 were female; aged from 6 to 23 months; course from 3 d to 6 d, with an average course of (4.13±0.37) d. Inclusion criteria: (1) those who were in accordance with the diagnostic criteria of RV enteritis[7]; (2) those whose faces were detected RV antigen positive by the colloidal gold; (3) those whose culture detection of shigella, salmonella, and pathogenic Escherichia coli; (4) whose microscopic

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examination of faces could occasionally see WBC, no RBC and pus cells. Exclusion criteria: (1) those who had severe dehydration, acidosis, water and electrolyte disturbance; (2) those whose course was less than 2 d; (3) those who were accompanied by congenital vital organ disease, toxic encephalopathy, and myocarditis; (4) those who had accepted related treatments. A total of 65 children with non-RV enteritis who were admitted in our hospital at the same stage were served as the control group, among which 30 were male, and 35 were female; aged from 6 to 24 months; course from 3 d to 5 d, with an average course of (4.11±0.32) d. The patients' faces were detected RV antigen negative by the colloidal gold. The study was approved by the Medical Ethical Committee. Informed consents were obtained from the patients' parents. The difference of gender, age, course, and other general materials between the two groups was not statistically significant (P>0.05), and it was comparable.

2.2. Methods

The patients in the observation group with liver and myocardial enzyme abnormality were given P-HGF (10 mg), ivdrip, 1 time/d, continuously for 1 week, glucurolactone tablets (50-100 mg), and fructose dipllosphate sodium (5-10 mL), po, 3 times/d, continuously for 2 weeks. The patients were given fluid infusion, intestinal mucosa protection, intestinal flora regulation, water and electrolyte disturbance correcting. The estimation criteria of liver and myocardial damage were in the following: ALT>40 U/L as liver damage; CK-MB>25 U/L as myocardial damage.

2.3. Observation indicators

A volume of 3 mL morning fasting venous blood after admission in the two groups was collected, centrifuged at 1 500 r/min for 10 min, separated for the serum, and preserved at -80 ℃. The full automatic biochemical analyzer was used to detect the serum ALT, AST, CK, CK-MB, LDH, and α-HBDH levels by ELISA. The liver myocardial damage children proportion was calculated. The liver function and myocardial zymogram in children with dehydration in different degrees in the observation group were compared. The liver function and myocardial zymogram changes before and after treatment in children with liver and myocardial damage in the observation group were detected and compared.

2.4. Statistical analysis

SPSS 18.0 software was used for the statistical analysis. The measurement data were expressed as mean±SD. The paired t test was used for the intra-group comparison, and the independent t test was used for the comparison between the two groups. After homogeneity test of variances, LSD-t test was used for the measurement data among the groups. The enumeration data were expressed as percentage, and chi-square test was used. P<0.05 was regarded as statistically significant difference.

3. Results

3.1. Comparison of liver function indicators and myocardial zymogram between two groups

The serum ALT, AST, CK, CK-MB, LDH, and α-HBDH levels in the observation group were significantly higher than those in the control group (P<0.05) (Table 1).

3.2. Comparison of occurrence rate of liver and myocardial damage between two groups

In the observation group, 45 cases had liver and myocardial damage, among which 32 were merged with liver damage, 37 were merged with myocardial damage, and 24 were merged with liver and myocardial damage. When compared with the control group, the rates of liver function abnormality and myocardial zymogram abnormality in the observation group were significantly elevated (P<0.01) (Table 2).

Table 1
Comparison of liver function indicators and myocardial zymogram between two groups (U/L).

Groups	n	Liver function		Myocardial zymogram			
		ALT	AST	CK	CK-MB	LDH	α-HBDH
Observation group	70	43.01±23.19	63.41±16.42	317.87±66.76	86.78±10.34	257.15±56.87	249.47±67.21
Control group	65	23.81±18.01	24.55±10.21	112.83±69.94	22.34±9.88	237.91±52.45	188.71±63.89
t		5.394	16.638	17.426	36.962	2.039	7.727
P		0.013	0.011	0.000	0.000	0.044	0.011

Table 2
Comparison of occurrence rate of liver and myocardial damage between two groups[n (%)].

Groups	n	Normal liver function	Abnormal liver function	Normal myocardial zymogram	Abnormal myocardial zymogram
Observation group	70	38(54.29)	32(45.71)	33(47.14)	37(52.86)
Control group	65	53(81.53)	12(18.46)	52(80.00)	13(20.20)
χ^2		11.394		15.603	
P		0.001		0.000	

3.3. Comparison of liver function and myocardial zymogram indicators in children with RV enteritis in different degree dehydration

The various indicators of liver function and myocardial zymogram in children with severe dehydration were significantly higher than those in the mild and no dehydration children (P<0.05). The various indicators of liver function and myocardial zymogram in children with mild dehydration were significantly higher than those in children with no dehydration (P<0.05) (Table 3).

3.4. Changes of liver function and myocardial zymogram indicators before and after treatment in children with liver and myocardial damage in observation group

The serum ALT, AST, CK, CK-MB, LDH, and α-HBDH levels after treatment in children with liver and myocardial damage in the observation group were significantly reduced when compared with before treatment (P<0.01) (Table 4).

4. Discussion

RV enteritis is a common infectious intestinal disease in the pediatrics, and is mainly transmitted through saliva and faces[8]. Some researches demonstrate that RV infection can induce myocardial and liver damage. The pathogenesis of myocardial damage is not yet clear, and may be associated with the various organ damage caused by RV which can reach the blood circulation through the gastrointestinal barrier[9].

During the initial stage of liver and myocardial damge in children with RV enteritis, the clinical symptoms are slight, and may threaten the children′s life and safety with no timely treatment; therefore, prevention of liver and myocardial damage in children with RV enteritis is especially important. Some researches demonstrate that[10] RV is hepatotrophic, while the liver vascular metabolism is vigorous, various enzymatic activity is unstable, and ALT and AST levels are elevated after RV infection. ALT is mainly originated from the hepatocytes, with kidney cells as the second origin, while AST is existing in the hepatocytes and myocardial cells, both of which are the most sensitive and direct indicators to reflect the liver damage, and whose elevated levels are positively correlated with the disease severity degree. Enzymes are abundant in the myocardial tissues. It is reported that[11] when there is a myocardial damage in children with RV enteritis at the acute stage, the serum ALT, AST, CK, CK-MB, LDH, and α-HBDH levels are significantly elevated; therefore, detection of serum ALT, AST, CK, CK-MB, LDH, and α-HBDH levels in the clinic can accurately reflect the liver and myocardial damage in children with RV enteritis. The results in the study showed that The serum ALT, AST, CK, CK-MB, LDH, and α-HBDH levels in the observation group were significantly higher than those in the control group (P<0.05); moreover, the change of CK and CK-MB was the most significant, indicating that RV can not only induce the typical gastrointestinal symptoms, but also cause severe liver and myocardial damage. Besides, the proportion of children with liver and myocardial damage in the observation group was significantly higher than that in the control group, which is identical to the above results and some related research results[12,13]. RV can invade the children′s small intestinal epithelium to promote its swelling, necrosis or detachment, which can affect the intestinal water absorption and disaccharide decomposition, and induce diarrhea and dehydration. It is reported that[14] the dehydration degree in children with RV enteritis is closely associated with the liver function and myocardial zymogram. The results in the study showed that the serum ALT, AST, CK, CK-MB, LDH, and α-HBDH levels in the observation group were significantly elevated with the acceleration of dehydration degree (P<0.05), proving that the dehydration degree in children with RV enteritis is positively

Table 3

Comparison of liver function and myocardial zymogram indicators in children with RV enteritis in different degree dehydration (U/L).

Dehydration degree	n	Liver function indicator			Myocardial zymogram		
		ALT	AST	CK	CK-MB	LDH	α-HBDH
No dehydration	23	31.04±17.54	47.30±16.31	193.95±54.89	52.55±8.41	243.12±26.54	197.33±57.66
Mild dehydration	28	38.31±18.02	55.14±13.55	247.82±59.27	65.47±6.37	259.59±27.93	241.84±61.27
Moderate dehydration	19	49.02±16.79	69.45±17.60	330.13±53.63	91.45±7.54	296.46±29.56	269.27±60.51
F		16.785	19.368	14.233	21.413	12.729	16.934
P		0.037	0.042	0.028	0.015	0.046	0.031

Table 4

Changes of liver function and myocardial zymogram indicators before and after treatment in children with liver and myocardial damage in observation group (n=45, U/L).

Time	Liver function		Myocardial zymogram			
	ALT	AST	CK	CK-MB	LDH	α-HBDH
Before treatment	44.13±16.19	64.57±14.42	316.98±56.76	86.92±8.34	260.17±26.81	255.88±47.21
After treatment	25.17±19.11	34.37±11.54	137.72±55.13	21.09±7.38	204.53±27.65	149.59±46.27
t	5.078	10.969	15.197	36.654	9.691	10.786
P	0.000	0.000	0.000	0.000	0.000	0.000

correlated with the elevation of myocardial zymogram. The results in the study showed that the serum ALT, AST, CK, CK-MB, LDH, and α-HBDH levels after treatment in children with liver and myocardial damage were significantly reduced when compared with before treatment (P<0.05), indicating that accurate and reasonable treatment can effectively alleviate the liver and myocardial damage degree in children with RV enteritis.

In conclusion, early detection of liver function and myocardial zymogram can accurately reflect the condition in children with RV enteritis, which can provide an evidence for the formulation of clinical treatment protocol.

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