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Research Article

Clinical Significance of Lipid Metabolism in Evaluating the Prognosis of Hyperlipidemic Acute Pancreatitis

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Abstract

Objective: To investigate the correlation between serum lipid metabolic indicators and MCTSI score in hyperlipidemic acute pancreatitis.

Methods: The serum lipid metabolic indicators and MCTSI scores of 97 cases ofhyperlipidemic acute pancreatitis were retrospectively analyzed from Jul. 2012 to Jul. 2016. The correlation of serum lipid metabolic indicators and MCTSI score were analyzed.

Results: There existed statistically significant difference of the apoA1 levels of patients among MCTSI score =2, =4, and ≥6 group, and the higher the MCTSI score was, the lower the apoA1 level was ($F = 10.004$, $P < 0.01$). The serum apoA1 level of hyperlipidemic acute pancreatitis patient was negatively correlated with MCTSI score($rs = -0.420$, $P < 0.01$). In the patients with lower serum apoA1 values, the number of patients whose MCTSI scores were ≥4 was significantly more than that of those whose MCTSI scores were 2($\chi^2 = 9.343$, $P < 0.01$). But there existed no statistically significant differenceof serum TG, TC, HDL-C, LDH-C, apoB and LP(A) levels among patients with MCTSI score =2, =4, and ≥6 group($F = 1.358, 0.585, 0.049, 0.439, 0.228, 0.168$, $P > 0.05$).There was no correlation between the levels of serum TG, TC, HDL-C, LDL-C, apoB, and Lp(A) and MCTSI score($rs = 0.014, 0.036, -0.061, -0.050, -0.008, -0.004$, $P > 0.05$).

Conclusion: Serum apoA1 level is a better indicator to evaluate the severity of hyperlipidemic acute pancreatitis. There is negative correlation between severity of hyperlipidemic acute pancreatitis and serum apoA1 level.

Keywords: Hyperlipidemic acute pancreatitis; Lipid; Apolipoprotein; MCTSI

Introduction

Acute pancreatitis is a common acute abdominal disease in clinical surgery. While the most frequent etiology of acute pancreatitis is biliary diseases in China, the incidence of acute hyperlipidemic pancreatitis has been significantly increasing due to the changes of eating habits and lifestyle, even at faster pace than that in developed countries[1]. Hypertriglyceridemia is considered as an initiation of the acute pancreatitis. Besides triglyceride, other lipid metabolic ingredients such as total lipid cholesterol, lipoproteins and apolipoprotein, are rarely studied in past literatures. Modified CT severity index(MCTSI) is one of the commonly used methods for assessing the severity of acute pancreatitis. This study analyzed retrospectively the serum levels of lipid metabolic indicators and CT imaging data of 97 cases with hyperlipidemic acute pancreatitis who was admitted to our hospital from July 2012 to July 2017. The aim is to investigate the correlation between the serum levels of lipid metabolic ingredients and MCTSI score. Then reveal the role and clinical significance of dyslipidemia in assessing the severity of hyperlipidemic acute pancreatitis.

Patients and Methods

Study patients

The clinical data of patients with acute hyperlipidemic pancreatitis were collected in our hospital from July 2012 to July 2017. After the patients with incomplete blood biochemical and imaging data or withpleural or peritoneal effusion before disease attack were excluded, 97 cases meet the study requirement. Among 97

cases, 65 cases were male and 32 cases were female. The age of the patients in the study group ranged from 26 to 72 years old. The mean age was 43±10 years old.

Diagnosis

Acute pancreatitis was diagnosed on the basis of the following criteria: 1. Clinical manifestations, symptoms and imaging findings; 2. Serum triglyceride concentration ≥ 11. 30 mmol/L or serum triglyceride concentration between 5. 65 mmol/L and 11.30 mmol/L while the physical state of serum is lactescent, given that other causes of acute pancreatitis are ruled out [2].

Methods

The blood samples of all the patients were collected under the condition of fasting once they were admitted to hospital so as to measure serum triglyceride, total cholesterol, high density lipoprotein cholesterol, low density lipoprotein cholesterol, apolipoprotein A1, apolipoprotein B and lipoprotein a. All patients underwent enhanced abdominal CT scan within 48-72 hours after admission. According to MCTSI scoring criteria, all the patients were divided into three groups: score 2 group, score 4 group and score ≥6 group, and blood lipid indicators among three groups were compared. The lipid indicators that existed statistical significance were picked out. Then, the patients were re-divided into two groups: score 2 group and score ≥4 group. Every serum lipid ingredient and apolipoprotein were compared.

MCTSI scoring criteria: (a) pancreatitis inflammation: normal pancreas, MCTSI score 0; pancreas or peripancreatic inflammation, MCTSI score 2; acute peripancreatic fluid accumulation in one or multiple places, MCTSI score 4. (b) parenchymal necrosis of the pancreas: no necrosis, MCTSI score 0; <30%pancreatic necrosis, MCTSI score 2; ≥30%pancreatic necrosis, MCTSI score 4. (c) pancreatic complications (including pleural effusions in single or multiple places, ascites, vascular complications and gastrointestinal complications, etc.): MCTSI score 2 [3].

Statistical Analysis

The continuous variables were expressed as Mean±SD. Comparisons were performed using one-way ANOVA(LSD test) for continuous variables and chi-square test for qualitative variables. Test for homogeneity of variance was performed before conducting one-way ANOVA. If homogeneity of variance was violated, sample statistics should go throughreciprocal conversion in order to pass the test for homogeneity of variance. Spearman's correlation analysis was conducted to calculate the correlation. SPSS 19.0 software was used for statistical analysis. $P<0.05$ was considered significant difference.

Results

Among the 97 patients with acute hyperlipidemic pancreatitis, the number of patients with MCTSI score =2, =4, and ≥6 was respectively 52 cases, 31cases and 14 cases. There were no significant difference about age, gender, total bilirubin and conjugated bilirubin values among three groups (F =0.045, 0.211, 0.049, 0.770, χ^2 =2.470, P >0.05) (Table 1).

	Total Bilirubin (μmol/L)	Conjugated Bilirubin (μmol/L)	Age	Gender	
				Male	Female
MCTSI score =2	16.88±7.93	3.09±3.62	43±10	31	20
MCTSI score =4	17.39±8.20	3.58±3.41	41±9	23	8
MCTSI score ≥6	17.40±7.82	3.51±2.71	46±12	11	3
Pvalue	0.956	0.811	0.466	0.291	
F value	0.045	0.211	0.77		
χ^2 value				2.47	

Table 1: Comparison of the age, gender and bilirubin in patients with different MCTSI scores(Mean±SD, n)

There was no significant difference of serum TG, TC, HDL-C, LDH-C, apoB and LP(A) levels among MCTSI score =2, =4, and ≥6 group(F =1.358, 0.585, 0.049, 0.439, 0.228, 0.168, P>0.05)(Table 2). And,no correlation was found between the levels of serum TG, TC, HDL-C, LDL-C, apoB, and Lp(A) and MCTSI score(rs =0.014, 0.036, -0.061, -0.050, -0.008, -0.004, P >0.05)(Table 3). But there existed significant difference of the apoA1 levels among the three groups, and the higher the MCTSI score was, the lower the apoA1 level was(F =10.004, P<0.05), (Table 2). An negative correlation existed between the serum level ofapoA1 and MCTSI score(rs = -0.420, P <0.01)(Table 3). The patients were re-divided into two groups according by the serum level ofapoA1, including the normal apoA1 group and low apoA1 group. Among the patients with low apoA1 level, the number of patients with MCTSI scores ≥4 was significantly higher than that of those with MCTSI scores =2(□□2=9.34, P <0.01), and the difference was significant difference (Table 4).

	n	TG mmol/L	TC mmol/L	HDL-C mmol/L	LDL-C mmol/L	apoA1 g/L	apoB g/L	Lp(A) g/L
MCTSI score =2	**52**	19.73±9.40	9.47±2.66	1.16±0.60	2.80±1.84	1.20±0.30	0.84±0.24	36.65±46.61

MCTSI score =4	**31**	17.39±8.91	9.21±3.51	1.12±0.64	2.84±1.47	1.03±0.24ac	0.88±0.40	40.80±89.22
MCTSI score ≥6	**14**	22.01±8.36	10.30±3.69	1.18±0.87	2.24±1.85	0.83±0.25b	0.84±0.36	47.64±51.00
F value		1.358	0.585	0.049	0.439	10.004	0.228	0.168
P value		0.262	0.559	0.952	0.647	< 0.001	0.797	0.846
[b]P<0.01 vs. MCTSI score 2, [a]P<0.05 vs. MCTSI score 2, [c]P<0.05 vs. MCTSI score ≥6								

	TG	**TC**	**HDL-C**	**LDL-C**	**apoA1**	**apoB**	**Lp(A)**
	mmol/L	**mmol/L**	**mmol/L**	**mmol/L**	**g/L**	**g/L**	**g/L**
Mean±SD	20.07±11.05	9.55±3.25	1.21±0.87	2.75±1.43	1.09±0.30	0.86±0.32	39.65±63.45
rs value	0.014	0.036	-0.061	-0.05	-0.42	-0.008	-0.004
P value	0.891	0.73	0.587	0.71	<0.001	0.94	0.968

Table 3: Correlation analysis between the levels of serum lipids and MCTSI score

MCTSI score	**apoA1(n)**		**χ^2 value**	**Pvalue**
	normal	**low**		
2	33	17	9.343	0.002
≥4	16	31		

Table 4: The difference of number of patients between normal and abnormal apoA1 levelsin different MCTSI score groups.

Discussion

With the development of medical technology and basic theory, there are many new treatment methods and ideas for acute pancreatitis, but the mortality rate in severe cases is still as high as 20% -30% [4]. In order to better guide the clinical treatment and improve the prognosis, the severity of pancreatitis need to be assessed in a simple and accurate way. At present, there are many systems and methods for the evaluation of acute pancreatitis. The modified CT Severity Score System (MCTSI) is widely used because of its simple, intuitive and high accuracy in evaluating prognosis[5]. Therefore, in this study, we selected the MCTSI score as the reference standard of severity of pancreatitis to investigate the correlation between lipid metabolism ingredients and severity of acute pancreatitis.

In addition to TG, there often exits other abnormal lipid metabolism in patients with acute hyperlipidemic pancreatitis. There are one or more than one abnormal lipid metabolism including TC, HDL-C, LDL-C, and apolipoprotein etc.in patients with acute hyperlipidemic pancreatitis. In addition, the onset of acute pancreatitis may cause secondary dyslipidemia [6,7]. In many lipid metabolism indicators, hypertriglyceridemia are closely related to acute pancreatitis. It may initiate the acute pancreatitis in many ways as follows: (1) Hydrolysis of triglycerides could produce a large amount of free fatty acid that damage pancreatic acinar and lead to local acidosis, then activate the pancreatin; (2) Impacting on pancreatic microcirculation; (c) Elimination of oxygen free radicals in pancreatic tissue; (3) Promoting the release of proinflammatory mediators; (4) Aggravating pancreatic necrosis [8]. However, there are few studies on effect of other abnormal lipid metabolism indicators on the initiation and development of acute hyperlipidemic pancreatitis, and there still exists some controversy on whether the serum lipid levels in patients with hyperlipidemic pancreatitis and the degree of dyslipidemia after acute pancreatitis attack are highly associated with the severity of the disease [2,9]. By analyzing the clinical data of the study group, our current results showed that the severity of acute hyperlipidemic pancreatitis had no correlation with serum TG, TC, HDL-C, LDL-C, apoB and LP(A)(P>0.05). But as the value of apoA1 became lower , the severity of acute hyperlipidemic pancreatitis would appear severer, and its severity was negatively correlated with apoA1(P<0.05). ApoA1 is a major component of high-density lipoprotein protein. It can promote the reverse cholesterol transport process and inhibit atherosclerosis [10,11].

In addition to its function in lipid metabolism, apoA1 is an important acute phase protein, being similar to C-reactive protein, which inhibits the inflammation in many aspects and protects body during the inflammatory response [12,13]. When the synthesis of apoA1 is inhibited by cytokines such as IL-6 and TNF-α during inflammation, apoA1 cannot play a role of its “anti-inflammatory” effect. it indicates that inflammatory reaction is out of control and results in poor prognosis [14,15,16]. To sum up, before the onset of acute hyperlipidemic pancreatitis, lipid metabolism disorder will decrease apoA1, may produce insufficient “anti-inflammatory” factors, and aggregate the severity of the disease. In patients with severe acute pancreatitis, excessive “proinflammatory” factors also might inhibit the synthesis of apoA1. Apo A1 is positively correlated with HDL-C level, while the apoA1 content of the HDL fraction is not a fixed proportion, which might be one of the rea-

sons why HDL-C is not associated with the MCTSI score in this study [17].

Therefore, early detection of serum level of apoA1 in patients with acute hyperlipidemic pancreatitis may serve as a sensitive marker for early assessment of the severity of acute hyperlipidemic pancreatitis. Significant reduction in the serum level of apoA1 may indicate very severe and poor prognosis of the acute hyperlipidemic pancreatitis. The lower the serum level of apoA1 is, the more severe the disease is. In the case, clinicians need to promptly make the appropriate response and treatment measures, such as keeping fluid, electrolyte and acid-base balance to ensure the stability of the internal environment, while maintaining the heart, lungs, kidneys and other vital organs functions in order to reduce the incidence of complications and improve prognosis in patients with acute hyperlipidemic pancreatitis.

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