

Original Article

Analysis of plasma exchange therapy in pregnant patients with hyperlipidemia

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Abstract: The study aims to explore the therapy for pregnant patients with different blood lipid levels. Clinical data from 60 pregnant women with hyperlipidemia were retrospectively analyzed in our hospital from January, 2008 to August, 2013. We found that chronic Health Evaluation II (APACHEII) score, length of patients stay in ICU (intensive care unit) and mechanical ventilation time were lower and prognosis was better in pregnant patients with hyperlipidemia who were treated with blood plasma exchange therapy in time than those in ICU routine therapy. Moreover, early plasma exchange therapy was especially beneficial for patients with more than five times of T riglyceride (TG) as normal value. In conclusion, pregnant women with hyperlipidemia should rationally choose plasma exchange therapy according to TG level.

Keywords: Pregnancy complications, hyperlipidemia, plasma exchange treatment

Introduction

Recent years, with the improvement of people's life styles in our country and the change of diets, incidence rate of hyperlipidemia is increased year by year; thrombosis is affected by T riglyceride (TG) which easily leads to avascular necrosis of pancreas tissues so as to result in hyperlipidemic pancreatitis (HLP) that was 1%-4% of the acute pancreatitis cases and the incidence was increased [1]. Severe degree of HLP, incidence and reoccurrence rate of complications were higher than other reasons caused pancreatitis [1, 2]; furthermore, hyperlipidemia is an important risk factor to cause HLP [3]. Serum in 4%-20% patients of all pancreatitis patients manifested chyle and more than 50% patients had different high lipid levels [4], and high TG level could interfere with acute mountain sickness (AMS) activity and make pancreatitis hard to be detected. Moreover, plasma might have some non-lipids factors that inhibit AMS activity [5]. Therefore, patients who suffer from bellyache, abdominal distension, nausea and vomiting are diagnosed as pancreatitis not only according to AMS levels in order to avoid misdiagnosis and missed diagnosis. Furthermore, its treatment regimen is

usually not satisfied. Presently, some retrospectively studies and randomized controlled trials reported that plasma exchange therapy had good effects on treating HLP [6, 7], and there was a well-recognized that physical examination (PE) quickly reduced TG levels and trypsinogen, but there was still not agreed on effectiveness and safety of PE in treatment of HLP, complications of pancreatitis patients and prognosis [8]. Thus, hyperlipidemic pancreatitis was performed not only routine therapy but alleviating blood hypercoagulable state through fast reducing blood lipid to avoid forming thrombosis so as to decline mortality [9]. However, pregnant women are the high risk people and TG, serum total cholesterol (TC) and phospholipid levels are affected by liver function and lipid metabolism during pregnancy. A great deal of insulin, progestational hormone and corticosteroids promote synthesis and storage of TG, TC and lipoprotein during early and medial pregnancy, which are stably increased with the progress of gestational weeks and reach the peak levels at late pregnancy. The peak levels are about 2-4 times as high as non-pregnancy periods [10]. More than 11.3 mmol/L of serum TG easily induced acute severe pancreatitis [11] and was harmful for mother and infants. How to

Table 1. Comparisons of TG concentration before and after treatment in two groups (mmol/L)

Group	No.	Before treatment	48 h after treatment	P value
PE	30	25.16±3.12	10.32±2.45	<0.01
Routine	30	17.03±3.32	14.89±2.13	

choose effective and safe treatment methods for pregnant women with hyperlipidemia is still not clear. This study mainly investigated the effect of PE therapy in pregnant women with hyperlipidemia according to different blood lipid levels in intensive care unit (ICU) of our hospital and observed recovery rate and complications. Here, clinical results were as follows.

Material and methods

General information

60 pregnant women with hyperlipidemia were enrolled in ICU of our hospital during January, 2008 to August, 2013, and diagnosis referred to guideline on prevention and treatment of blood lipid abnormality in Chinese adults revised by joint committee in 2007. The age ranges was from 19 to 43 years and mean age was 29.3±9.5 years old, and gestational weeks range was from 22 to 36 weeks, and mean week was 27.2±3.7 weeks. In addition, there were 21 primiparas and 39 multiparas. Furthermore, mean Acute Physiology and Chronic Health Evaluation II (APACHEII) score was 19.85±3.23, and TG level range was from 4.32 to 29.17 mmol/L (mean: 23.21±5.36 mmol/L). This study was conducted in accordance with the declaration of Helsinki. This study was conducted with approval from the Ethics Committee of Hangzhou First People's Hospital. Written informed consent was obtained from all participants.

Treatment methods

ICU treatment method was that 30 patients were treated by ICU routine management, including strictly controlling diet, feeding low energy, lipid-lowering drugs treatment and other support, and 30 patients were treated by ICU routine management plus plasma exchange treatment. Procedures of plasma exchange: established vascular approach, then performed femoral vein or internal jugular vein catheterization with single-needle dual-lumen hemodialy-

sis tube; the instruments, ancillary tubes, plasma separator and materials used for plasma exchange were purchased from Braun Co., Germany. Pre-washing solution: 1500 ml of NS plus 12,500 units of heparin, with fresh artificial plasma for plasma exchange.

Hospital data were collected and undergone clinical statistical analysis, including general data, causes of diseases, clinical manifestation, all assistant examinations within 24 h after admission, ICU treatment before and after examinations and prognosis conditions.

Observations of indicators

Clinical indicators included mortality rate within 28 days, APACHEII score 48 h after treatment, ICU stays and mechanical ventilation time.

Statistical processing

Retrospectively analysis was used to record 60 cases, including TG levels, ICU managements, APACHEII score 48 h after treatment, mortality rate within 28 days, ICU stays and mechanical ventilation time. All data were analyzed by SPSS17.0 software and measurement data results were presented as mean ± SD. Student-t test was used to compare two groups. Count data was compared using Chi-square test. P<0.05 was considered statistically significant.

Results

TG levels

Levels reduced obviously in ICU routine management plus plasma exchange treatment group compared with ICU routine management alone group (**Table 1**).

Comparison of clinical indicators

APACHEII score 48 h after treatment and TG levels were significantly lower in ICU routine management plus plasma exchange treatment group than those in ICU routine management alone group (**Table 2**).

Treatment effects

28 d mortality rates, ICU stays and mechanical ventilation time were significantly lower in ICU routine management plus plasma exchange

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Table 2. Comparisons of APACHEII score and blood TG concentration before and after treatment in two groups ($\bar{x} \pm s$)

Group	No.	X1	X2	X1-X2	P value	X3	X4	X3-X4	P value
Routine	30	17.03 \pm 3.32	13.10 \pm 4.92	4.41 \pm 1.89		17.03 \pm 3.32	14.89 \pm 2.13	2.98 \pm 1.14	
PE	30	19.22 \pm 2.52	13.23 \pm 4.46	6.56 \pm 2.12	0.032	25.16 \pm 3.12	10.32 \pm 2.45	15.15 \pm 1.69	0.013

Table 3. Comparisons of clinical effectiveness in two groups

Group	No.	28 d mortality (n, %)	ICU stays (d)	Mechanical ventilation time (d)
Routine	30	2 (6.7)	15.92 \pm 5.61	13.16 \pm 1.13
PE	30	1 (3.3)	9.68 \pm 6.71	8.62 \pm 3.24
P value		<0.05	<0.05	<0.05

treatment group than those in ICU routine management alone group, which was statistically significant difference ($P < 0.05$, **Table 3**).

Discussion

With the improvement of life style in the past few years, unreasonable nutrient intake during pregnancy and an increase of very low density lipoprotein (VLDL) level induced by estrogen improved TG levels to obviously increase incidence rate of hyperlipidemia in pregnant women. In addition, serum TG of pregnant women was also increased due to the change of hormones to make acylation stimulating protein become important lipogenic factor, especially increased plasma acylation stimulating protein and low density lipoprotein (LDL) correlation with hyperlipidemia at late pregnancy [12, 13]. Under all kinds of inducing factors, blood TG levels were acutely increased so as to cause acute pancreatitis (AP) [14]. Nearly, hyperlipidemia was well known as inducement of AP, but it was ignored in clinical practice because hyperlipidemia was about 1%-4% causes of AP, followed by biliary pancreatitis and alcoholic pancreatitis [15]. The mechanism was that high TG levels in pancreas and peri-pancreatic tissue was hydrolyzed by pancreatic lipase and locally produced a great deal of free fatty acid (FFA) which gathered in pancreas tissues to injury pancreatic acinar cells and pancreatic capillaries [16]. Thus, hyperlipidemia was harmful for mother and infants, even resulted in abortion at early pregnancy and fetal distress and fetal death at late pregnancy and multiple organ failure for pregnant women. Systemic inflammatory response syndrome,

postpartum hemorrhage and disseminated intravascular coagulation (DIC) were the causes of death in high risk pregnant lying-in women, and Sivakumaran reported that hypertriglyceridemia could significantly improve mortality of mother and baby [17]. Quickly and effectively reducing TG level was the key to treat pregnancy combined with hyperlipidemia. Presently, lipid lowering drugs had poor effect. Plasma exchange was an effective replaced method that was the removal, treatment and return of blood plasma from blood circulation. Plasma exchange could timely and quickly clear related factors of diseases and abnormal plasma components, for example, reducing inflammatory mediators, fibrinogen level and improving symptoms to enhance reticuloendothelial cell systemic function under some pathological conditions, even getting necessary substances from replaced solutions. Plasma exchange could reduce TG concentration quickly [18]. Saravanan indicated that two consecutive plasma exchanges led to a remarkable reduction in TG levels of 73% and 82%, respectively [19]. Tan D also proved that PE could obviously reduce serum TG levels and inflammatory factors, such as tumor necrosis factor (TNF) level, to improve clinical symptoms fast. However, when plasma exchange should be treated with hyperlipidemia was still not resolved, especially TG critical value. Yadav et al. [20] suggested that less than 5.56 mmol/L of serum TG level could effectively inhibit the occurrence of hyperlipidemia. This study implied that the APACHEII score and TG levels were obviously improved 48 h after ICU routine management plus plasma exchange treatment in pregnant women with hyperlipidemia, meanwhile, lengths of patients stay in ICU and mechanical ventilation time were shorter and prognosis was better in ICU routine management plus plasma exchange treatment group than those in routine management group, moreover, our experience suggested that plasma exchange treatment was chosen as early as possible when the TG level was 5-10 times as high as normal value in pregnant women with

hyperlipidemia, which was benefit for patients' prognosis.

In a word, when TG level was increased by 5-10 times higher than normal level, PE therapy could be chosen as early as possible for high risk pregnancy and lying in women combined with hyperlipidemia. Additionally, PE should be performed within 24 h after admitted hospital. Some patients should be performed PE repeatedly until serum TG level maintained less than 5.65 mmol/L level, which effectively blocked the occurrence of complications and was benefit for prognosis. These results were in line with previous reports [21]. Of course, plasma exchange was a trauma treatment and had risk, most important of all; the blood supply was not enough. Therefore, pregnant patients with hyperlipidemia were conducted PE management as early as possible according to actual TG level, which reduced blood lipid levels and mortality. However, the pathphysiological mechanisms of pregnancy combined with hyperlipidemia are very complicated and the related studies need be studied further so as to find out optimal therapy regimens and reduce complications, and reclined the mortality of high risk pregnant women.

Disclosure of conflict of interest

None.

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