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Metabolic Disorder of Amino Acids in Chronic Liver Disease and Progress in Treatment of Branched Chain Amino Acids

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Abstract: In recent years, the incidence rate of chronic liver disease is on the rise, and has become a global disease. Chronic liver disease is caused by long-term chronic liver injury, which will gradually develop into liver fibrosis, and severe liver fibrosis will lead to liver cirrhosis. The purpose of this study is to study the metabolic disorder of amino acids in chronic liver disease and the progress of branched chain amino acid therapy. This paper mainly introduces the disorder of amino acid metabolism and branched chain amino acids in chronic liver disease, and then collects the patients with chronic liver disease admitted to the Department of Gastroenterology of our hospital from January 2019 to December 2019. The patients were randomly divided into two groups: one group of ordinary treatment group, one group of branched chain amino acid treatment group, the general treatment group was treated with water-soluble vitamin liver protection, and the branched chain amino acid group was treated with intravenous drip column of 300ml branched chain amino acid. Then the clinical symptoms and signs, liver function, albumin and cytokines of the two groups were compared and analyzed before and after treatment. The results showed that: the clinical symptoms and signs, liver function, albumin and cytokines were significantly improved in the common group and BCAA group. Compared with the normal group, BCAA group increased appetite and edema of lower limbs by 15% and 47% respectively. The effect of BCAA on IGF-I and cytokine levels was better than that of water-soluble vitamin. Therefore, the effect of branched chain amino acids in the treatment of chronic liver disease is far better than that with water-soluble vitamins.

1. Introduction

Liver is the core organ of regulating metabolism. In recent years, the incidence rate of chronic

liver disease is on the rise, and has become a global disease. Now more and more patients with chronic liver disease appear liver fibrosis, and in the late liver failure and then endanger the lives of patients. Liver fibrosis is a complex process of chronic liver injury, usually accompanied by liver parenchymal cell damage. Chronic liver diseases causing liver fibrosis include viral hepatitis, alcoholic liver disease, schistosomiasis liver disease, nonalcoholic fatty liver disease and autoimmune liver disease. Liver fibrosis is characterized by deposition of extracellular matrix (ECM) in liver tissue. With the development of liver fibrosis, a large number of hepatocytes are damaged, and the normal structure of hepatic lobules is destroyed, forming pseudo lobules, which is called cirrhosis stage. In the late stage of liver cirrhosis, portal hypertension and irreversible liver function damage often lead to portal hypertension rupture and bleeding, ascites, spontaneous peritonitis and liver failure. About 1-7% of patients may become cancerous and form liver cancer. The occurrence of advanced liver cirrhosis and liver cancer has become one of the public health problems that seriously threaten the health of our citizens and increase the economic burden of our country. Therefore, it is very important to prevent and effectively reverse the occurrence and development of chronic liver disease.

Fukuda R used nested polymerase chain reaction (PCR) to detect hbvdna in 34 patients (52.3%). In virology, all 34 patients found HBV with 8 nucleotide deletions in the core promoter region [1]. Tsuda F used reverse transcription polymerase chain reaction to deduced a set of primers from a helicase-like region, and searched for a newly identified non-A to A virus temporarily named GB virus C (GBV-C) among patients in Indonesia. RNA of hepatitis E virus [2]. Pant C extracted data from a sample of inpatients across the country from 2002 to 2012. The following results were checked: hospital mortality, total cost, length of stay (LOS), patient demographics, surgery, complications, and comorbidities. Statistical analysis included regression analysis to test factors related to HRS [3]. Patr ćia dos Santos Marcon assessed demographic and clinical data, including lifestyle habits, such as illegal drug or alcohol abuse, and the frequency and reasons for admission through medical records review [4].

Ren m study was conducted to investigate the regulatory effect of porcine epithelial β - defensin on branched chain amino acids (BCAA) in vitro and in vivo. BCAA treatment increased the relative mRNA expression of β - defensin in jejunum and ileum of weaned piglets. In ipec-j2 cells, isoleucine, leucine and valine can stimulate the expression of β - defensin, which may be related to the stimulation of ERK1 / 2 phosphorylation. Inhibition of SIRT1 and ERK completely blocked the activation of ERK and 90rsk proteins by isoleucine, and decreased the expression of defensin [5]. Chen if study aims to explore the effects of branched chain amino acids, arginine and citrulline supplementation on central fatigue of well-trained Taekwondo athletes after three simulated competitions. In a double-blind randomized crossover design, 12 male Taekwondo athletes conducted two trials, each consisting of three simulated competitions. There are three rounds of 2-minute high-intensity interval training in each game. At the end of the second game, two different supplements were taken. In the AA trial, subjects received 0.17 g / kg BCAA, 0.05 g / kg arginine and 0.05 g / kg citrulline, while placebo was given in the PL trial. After each competition, the students' cognitive ability was tested by Taekwondo specific reaction test [6]. Hole? EK demonstrated that the key roles of branched chain amino acid metabolism are: (1) skeletal muscle is the starting site of branched chain amino acid catabolism, accompanied by the release of alanine and glutamine into the blood; (2) the activity of branched chain keto acid dehydrogenase (bckd); and (3) the amination of branched chain ketoacids (bckas). The increased consumption of branched chain amino acids during the process of detoxification of ammonia in muscle is the reason for the decrease of branched chain amino acids in liver cirrhosis and urea cycle disorder. In subjects with chronic renal failure, trauma, burns, sepsis, cancer, and phenylbutyrate treatment and during exercise, the increase of bckd activity is the cause of increased BCAA oxidation [7]. Sun h analyzed

the transcriptomics and metabonomics of heart failure mice induced by pressure overload. Inhibition of BCAA catabolic gene expression and tissue accumulation of branched chain ± -ketoacids are considered to be an important marker of cardiac metabolic reprogramming in mice with heart failure, and it has also been confirmed to exist in human cardiomyopathy heart. Molecular and genetic evidence suggests that the transcription factor krppel like factor 15 is a key upstream regulator of BCAA catabolism in the heart. Studies using gene mouse model showed that BCAA catabolism deficiency promoted heart failure, which was related to oxidative stress and metabolic disorder caused by mechanical overload [8]. Giesbertz P reviewed some findings of BCAA metabolism in recent years, and discussed their roles as reporter molecules for insulin sensitivity and diabetes mellitus and their possible contribution to disease progression. Changes in plasma and urine levels are mainly due to changes in tissue metabolism. Therefore, recent studies have focused on organ specific changes in the treatment of BCAA using animal models and human tissue samples. In peripheral tissues, decreased mitochondrial oxidation has been shown to be associated with increased inflammatory tension and changes in adiponectin and leptin levels. These changes appeared before the formation of insulin resistance [9].

In this paper, we collected the patients with chronic liver disease admitted to the Department of Gastroenterology of our hospital from January 2019 to December 2019. The patients were randomly divided into two groups: one group of ordinary treatment, the other group of branched chain amino acid treatment, and then the clinical symptoms and signs, liver function, albumin, cytokines of the two groups before and after treatment were compared and analyzed. In the treatment of chronic liver disease with branched chain amino acids, the clinical symptoms and signs, liver function, albumin and cytokines have been greatly improved. The effect of branched chain amino acids in the treatment of chronic liver disease is far better than that of water-soluble vitamins.

2. Amino Acid Metabolic Disorder and Branched Chain Amino Acids in Chronic Liver Disease

2.1. Disorder of Amino Acid Metabolism in Chronic Liver Disease

As an important organ of protein metabolism, fat and carbohydrate, liver damage caused by different reasons will cause metabolic disorders in patients. Liver cirrhosis is the final stage in the development of various liver diseases. With the aggravation of liver damage, the nutritional metabolism of patients changed significantly.

(1) Amino acid metabolism

The abnormal metabolism of amino acids was mainly manifested by the decrease of serum albumin, the increase of blood ammonia and the imbalance of amino acid ratio. In addition to the main protein synthesis site of the plasma, almost all proteins can be synthesized in the liver. However, in chronic liver disease, the metabolism of hepatocytes is damaged, the ornithine circulation is blocked, and a large amount of ammonia is accumulated in the body, and the blood ammonia is increased [10-12]. In patients with chronic liver disease, the internal environment is disordered, especially the disorder of amino acid metabolism. The serum BCAA level was lower than normal due to insufficient plasma amino acid intake and increased peripheral muscle tissue consumption in patients with chronic liver disease. Due to the damage of liver cells, the aromatic amino acids are catabolized by hepatocytes, and the aromatic amino acids are increased obviously. The ratio of serum branched chain amino acids and aromatic amino acids is out of balance and enters the blood-brain barrier. The serum branched chain amino acids and aromatic amino acids have mutual inhibition and repulsion effects. Therefore, the decrease of serum branched chain amino acids causes the increase of aromatic amino acids and the pseudoneural transmission in the brain. As a result, the normal neurotransmitters are decreased, leading to the occurrence of hepatic

encephalopathy.

(2) Fat metabolism

The liver is a metabolic center involved in lipid synthesis, transportation, storage and decomposition, and is also an important hub of lipoprotein and catabolism. With the decrease of the number of hepatocytes, the reserve and synthesis capacity of the liver decrease, and the levels of various hormones in the body, such as estrogen, insulin, glucagon and thyroxine, change. They reduce the synthesis of apolipoproteins and lipids and increase their decomposition. The liver may participate in the formation of apolipoproteins and blood lipids. When liver cirrhosis occurs, the number of liver cells decreases, the liver synthesis capacity is insufficient, and the synthesis of lipoprotein and lipid is decreased, which affects the lipid metabolism. At the same time, the levels of estrogen, thyroid hormone and glucagon in the body are in disorder, which promotes fat decomposition and composes various lipid synthesis. At the same time, chronic liver disease patients due to energy and nutrition metabolism disorders, long-term negative nitrogen balance, ketone body content is 4-5 times the normal value, easy to lead to ketoacidosis. After liver cirrhosis, due to liver parenchyma fibrosis, bile duct compression occlusion, cholestasis, etc., lead to poor bile excretion, resulting in fat absorption, decomposition, metabolism and other abnormalities.

(3) Glucose metabolism

Liver is an important organ to maintain blood glucose stability. It can maintain blood glucose stability by synthesizing and decomposing glycogen. In patients with chronic liver disease, glucose metabolism disorder can lead to carbohydrate energy disorder, hyperinsulinemia and insulin resistance. Long term glucose metabolism disorder may promote liver fibrosis and even develop into liver cancer. On the one hand, the body reduces the anaerobic glycolysis of glucose and the uptake of glucose by skeletal muscle, resulting in the reduction of glycogen synthesis in skeletal muscle. On the other hand, the receptor activity and sensitivity of insulin target organ decreased, which further promoted insulin secretion. In addition, due to liver dysfunction, insulin inactivation slows down and blood insulin concentration increases. The glucose transporters in the main insulin-mediated glucose uptake signaling pathway are not activated, so they cannot transport glucose effectively, resulting in hyperinsulinemia, which can reverse the inhibition of insulin binding to receptor, lead to insulin resistance and reduce glucose metabolism.

The metabolic disorder of three nutrients in patients with liver cirrhosis is mainly manifested as impaired glucose tolerance and insulin resistance, and some patients develop hepatogenic diabetes mellitus. At the same time, the synthesis of lipids such as cholesterol and apolipoprotein is reduced, and the production of ketones is increased. In the process of protein metabolism, plasma protein level decreased significantly, blood ammonia level increased, and the ratio of serum branched chain amino acids to aromatic amino acids decreased. Various metabolic abnormalities in the human body lead to protein and energy dystrophy. Insufficient energy supply aggravates the damage of organs, hinders various life activities of the body, and reduces the survival rate of patients. By increasing the use of glucose and milk fat as energy, ensure that the body has enough calories every day, thereby reducing the production of ammonia from protein decomposition.

2.2. Branched Chain Amino Acids

Among all amino acids, 8 are essential amino acids, among which 3 are leucine, valine and isoleucine. Because they all have branched chains, they are called branched chain amino acids (branched chain amino acids). BCAA is not only a substrate for protein synthesis, but also has other special functions. It is an essential nutrient for the normal growth of animals and the maintenance of the stability of the body. It is also an essential nutrient for the synthesis of various bioactive substances in the body. In the process of BCAA metabolism, the amino groups are mainly

transported to pyruvate and glutamic acid, which are converted into alanine and glutamine, respectively. After alanine enters the liver, it is deamination and converted to pyruvate. At the same time, it is converted into glucose by gluconeogenesis and reaches the liver. The lost amino group is converted into urea in the liver, forming a glucose alanine cycle. Therefore, we found that BCAA can exert its biological function through complete oxidation of the cycle. BCAA is an essential amino acid that cannot be synthesized by human and animal. It has a variety of biological functions and plays an important role in animal growth and development, such as affecting the growth performance of the body, regulating the body's oxidative energy supply, glucose metabolism, fatty protein metabolism, etc.

(1) Effect of branched chain amino acids on chronic liver disease

Branched chain amino acids, including valine, leucine and isoleucine, are essential amino acids for human body. Branched chain amino acids account for 14% - 18% of the total amino acid content of skeletal muscle protein. Liver cirrhosis patients had abnormal energy metabolism and oxidation, lower respiratory quotient, lower protein specifications, increased fat consumption and reduced sugar use. Hyperglycemia was accompanied by abnormal fat metabolism and amino acid metabolism. 60-80% of patients with liver dysfunction are oxidized by fat and protein, and about 30% of the energy of human body is supplied by branched chain amino acids, so the demand for branched chain amino acids is increased. As an essential amino acid, branched chain amino acid contains a large number of leucine, isoleucine and valine. A large number of clinical trials have found that the clinical symptoms and signs (such as abdominal distension, poor appetite, edema, etc.) and liver function of patients with liver cirrhosis have been improved, and the serum albumin level has gradually increased. Branched chain amino acids are mainly metabolized in skeletal muscle, not through liver metabolism, which can reduce liver burden, regenerate liver cells, improve clinical symptoms and liver function of patients, maintain normal coagulation function, prevent progressive liver failure, improve neutrophil phagocytosis and NK cell activity in patients with liver cirrhosis, enhance immunity and reduce the incidence of secondary infection.

(2) Antagonism

Due to the impaired liver function, the liver's ability to clear insulin and absorb glucose is reduced, which leads to abnormal glucose metabolism and insulin resistance. BCAA can improve insulin resistance index and increase insulin sensitivity. Leucine and isoleucine can improve insulin induced impaired glucose tolerance by increasing glucose transporters. Branched chain amino acids improve insulin resistance in liver, fat and muscle through different mechanisms.

In the liver, branched chain amino acids regulate the pathway of liver sterol regulatory protein binding protein and activate related trypsin and vector. In addition, BCAA could inhibit the expression of glucose-6-phosphatase and gluconeogenesis in liver. In muscle tissue, branched chain amino acids promote glucose transport through cell membrane by activating phosphatidylinositol 3 kinase and protein kinase C, thus improving insulin resistance by interacting with insulin target organs.

High uptake of valine is one of the characteristics of amino acid metabolism in tumor tissues. Reducing the concentration of valine can enhance the anti-tumor effect, and the maximum inhibitory effect can be achieved when there is a large amount of valine deficiency. However, due to valine is an essential amino acid for human body, the complete lack of valine will also affect the nutritional status of the host, resulting in a series of side effects such as weight loss, hypoproteinemia, fatty liver, bone marrow suppression, etc. Therefore, when the content of valine is insufficient, increasing Leu can reduce the uptake and utilization of valine by tumor cells, and enhance the inhibitory effect on tumor.

3. Experimental Design

3.1. Experimental Data Collection

The experimental data were obtained from patients with chronic liver disease admitted to the Department of Gastroenterology of our hospital from January 2019 to December 2019. The patients or their families agreed to sign the informed consent.

Inclusive criteria: (1) the total score of nrs2002 was more than 3 points, or the MNA score was less than 24 points;(2)30-65 years old; (3) according to the indications of oral enteral nutrition support;

Exclusion criteria: (1) patients with severe cardiovascular, brain, lung, kidney and other important organ diseases; (2) patients with hepatorenal syndrome, hepatic encephalopathy, gastrointestinal bleeding, liver coma and other symptoms; (3) mental patients, pregnant women, lactating women; (4) serious or unacceptable adverse reactions; and;

After screening, there were 56 males and 24 females, aged 48-65 (55 ± 11) years. The average course of disease was 6.5 (2-16) years. The patients were randomly divided into BCAA group (48 cases) and common group (32 cases).

3.2. Experimental Scheme

(1) BCAA group: compound amino acid injection, 300ml, intravenous drip column, once a day, for 30 days. At the same time, water-soluble vitamins were given to protect liver; general group: the general group was given water-soluble vitamin liver protection treatment.

(2) The clinical symptoms and signs of the two groups were observed before treatment;

(3) 6ml fasting blood was collected before and after treatment in two groups. The serum was separated by conventional centrifugation and stored in - 80 ℃ refrigerator;

(4) The serum levels of total bilirubin (TBIL), alanine aminotransferase (ALT), albumin (ALB), insulin-like growth factor 1 (IGF-1), tumor necrosis factor (TNF - α) and interleukin-10 (IL-10) were detected before and after treatment.

(5) The clinical symptoms and signs of the two groups were observed after treatment;

(6) The detected data were expressed as mean ± standard deviation (x ± s). The mean value of two samples and the mean value of paired design data were compared by t-test. $P < 0.05$ was statistically significant.

4. Analysis of Experimental Results

4.1. Changes of Clinical Symptoms and Signs

Before treatment, the general group had 38 / 38 cases of weakness, 31 / 38 cases of abdominal distension, 31 / 38 cases of anorexia, 29 / 38 cases of lower extremity edema. After liver protection treatment with water-soluble vitamins, symptoms were relieved to a certain extent, including fatigue 25 / 38 cases, abdominal distension 18 / 38 cases, anorexia 13 / 38 cases, leg edema 20 / 38 cases.

In BCAA group, 46 / 48 patients had myasthenia, 36 / 48 abdominal distension, 46 / 48 anorexia and 32 / 48 lower extremity edema. After amino acid treatment, the above symptoms were relieved in varying degrees, including weakness in 23 / 48 cases, abdominal distension in 15 / 48 cases, anorexia in 6/48 cases and edema in lower limbs in 10 / 48 cases. After treatment, the clinical symptoms and signs of the patients were significantly improved, the difference was statistically significant. The details are shown in Figure 1:

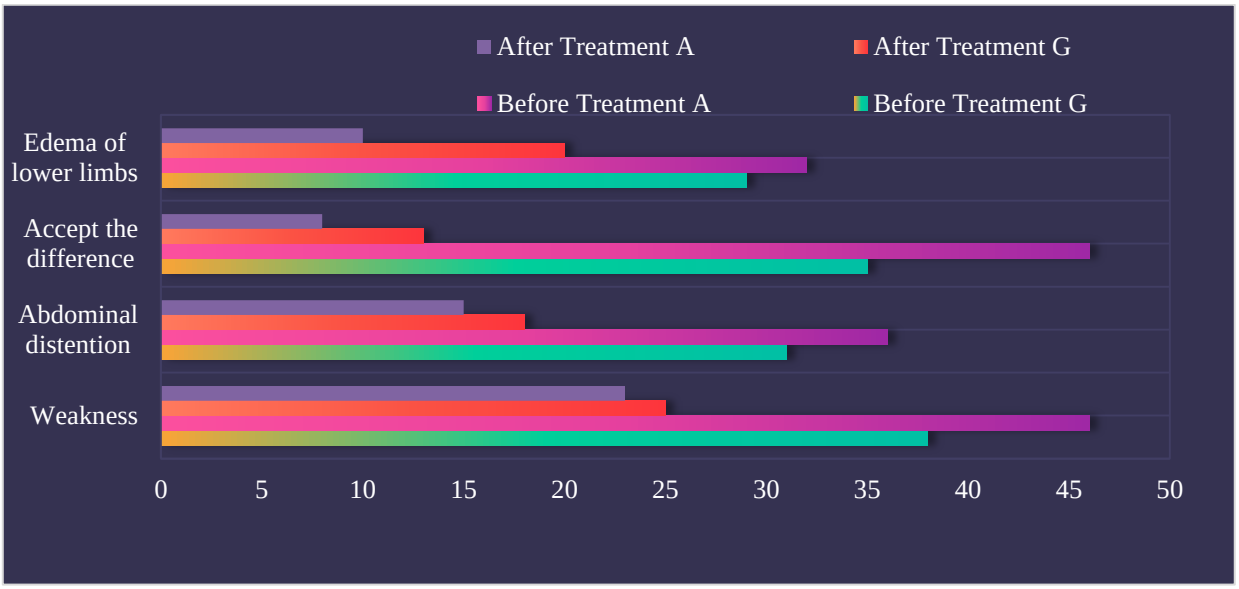

Figure 1. Changes of clinical symptoms and signs of chronic liver disease after general treatment and amino acid treatment

Before treatment, there was no significant difference in fatigue, poor appetite, abdominal distension, bilateral lower limb edema between the BCAA group and the general group, which made the symptoms and signs of the two groups comparable. After treatment, fatigue, anorexia, abdominal distension and edema of bilateral lower limbs were significantly improved in both groups. In terms of fatigue and abdominal distension, the number of cases in BCAA group and general group decreased after treatment, but there was no significant difference between the two groups. In terms of poor appetite and edema of lower limbs, the number of cases in BCAA group and common group was significantly reduced, and the difference between the two groups was significant.

4.2. Changes of Liver Function and Albumin

The changes of liver function and albumin before and after treatment were shown in Table 1 and Figure 2:

Table 1. The average value of liver function and albumin after treatment in chronic liver disease group and branched chain amino acid group

Group	y	Before Treatment			After Treatment		
		The average value of TBIL (μmol/L)	The average value of ALT (U/L)	The average value of ALB (g/L)	The average value of TBil (μmol/L)	The average value of ALT (U/L)	The average value of ALB (g/L)
General treatment group	38	61.89	114.65	21.39	27.65	48.78	5.12
Amino acid group	48	60.65	119.56	20.56	26.51	53.68	9.12

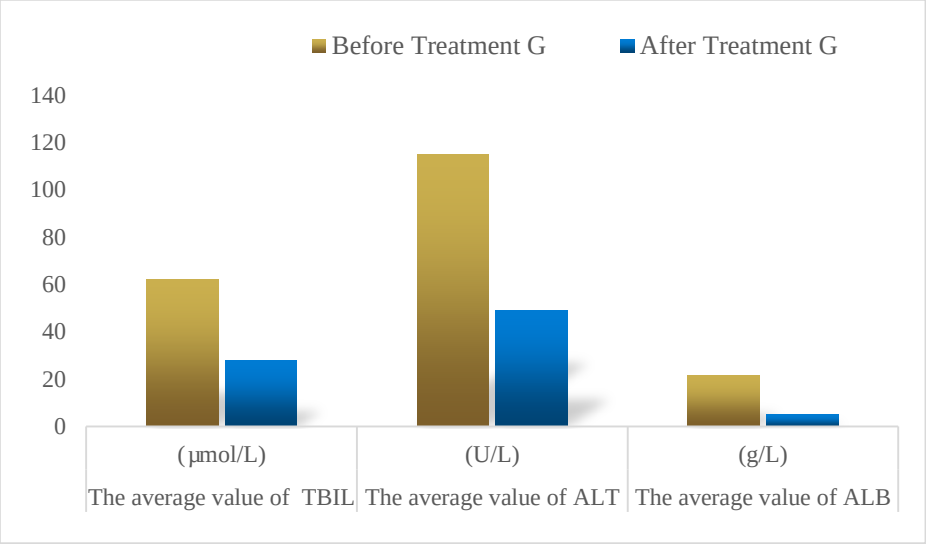

Figure 2. Changes of liver function and albumin in patients with chronic liver disease before and after treatment

It can be seen from Figure 2 that after the treatment of water-soluble vitamins, TBIL, alt, ALB and other liver function indexes in the general group were significantly higher than those before treatment. Conclusion: water soluble vitamin can improve TBIL, alt, ALB and other liver function indexes in the treatment of chronic liver disease.

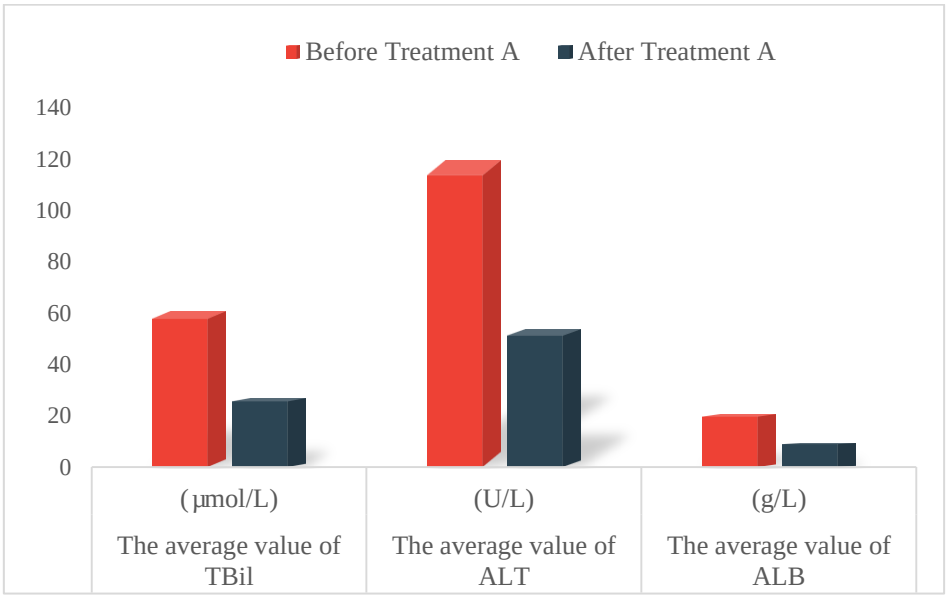

Figure 3. Changes of liver function and albumin in patients with chronic liver disease before and after treatment with branched chain amino group

It can be seen from Figure 3 that after BCAA treatment, TBIL, alt, ALB and other liver function indexes of BCAA group were improved to varying degrees compared with those before treatment. BCAA treatment of chronic liver disease can also effectively improve TBIL, alt, ALB and other liver function indicators.

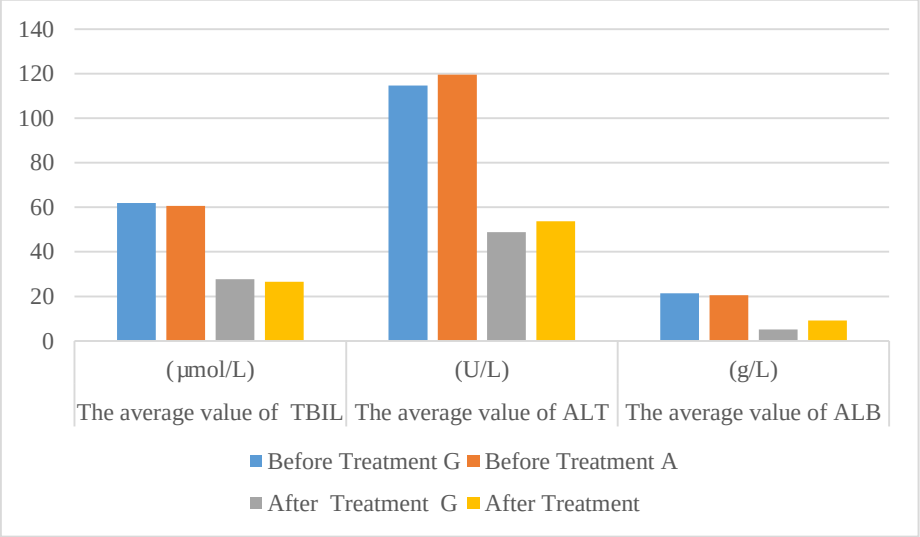

Figure 4. The average value of liver function and albumin after treatment in chronic liver disease group and branched chain amino acid group

The average value of liver function and albumin after treatment in chronic liver disease group and branched chain amino acid group are show in Figure 4.There was no significant difference in TBIL, alt, ALB between the two groups before treatment. After treatment, TBIL, ALT and ALB in the common group and BCAA group were significantly improved. TBIL, ALT and ALB were significantly improved by the two treatments. Compared with the normal group, BCAA treatment had no significant improvement on TBIL and alt, but ALB treatment was more obvious. The improvement effect of branched chain amino acids on white protein was better than that of water-soluble vitamins.

4.3. Comparison of Igf-i, Tnf - α and Il-10 Changes

The general group was treated with water-soluble vitamins. The indexes of IGF-I, TNF - and IL-10 were improved to some extent. Water soluble vitamin can effectively improve IGF-I, TNF - and IL-10 in the treatment of chronic liver disease.

After amino acid treatment, IGF-I, TNF - α and IL-10 in BCAA group were improved. Amino acid treatment of chronic liver disease can effectively improve IGF-I, TNF - α and IL-10.
The specific data are shown in Table 2 and Figure 5:

Table 2. Changes of IGF-I, TNF - α, IL-10 and IL-4 in patients with chronic liver disease treated by common treatment group and amino acid group

Group	y	Before Treatment			After Treatment		
		IGF-I (pg/ml)	TNF-α(pg/ml)	IL-10(pg/ml)	IGF-I (pg/ml)	TNF-α(pg/ml)	IL-10(pg/ml)
General treatment group	38	68.56±15.18	18.65±4.12	18.45±3.68	73.25±15.89	9.98±3.25	20.78±3.15
Amino acid group	48	66.56±14.45	12.65±3.05	20.38±3.98	79.56±18.55	8.65±2.25	15.48±3.56

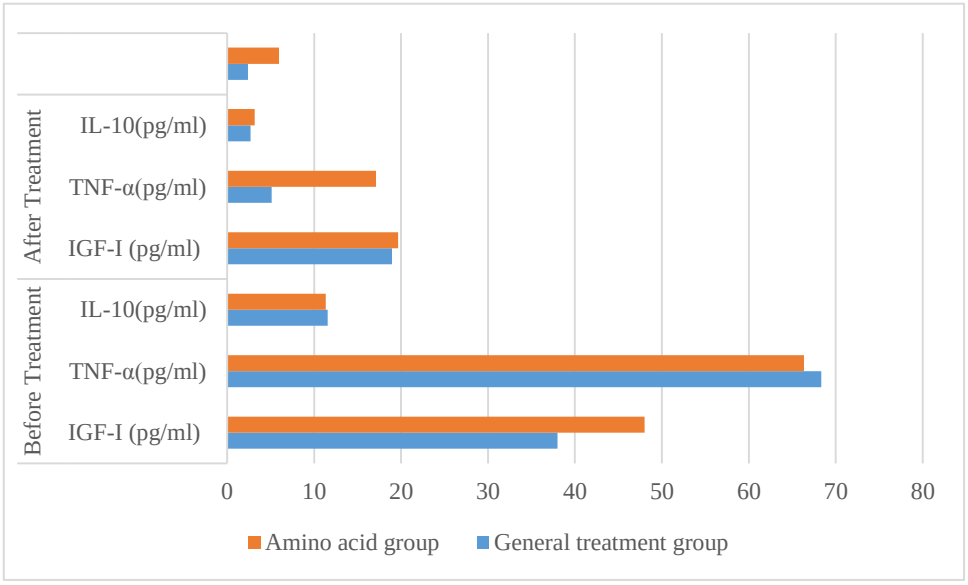

Figure 5. Changes of IGF-I, TNF - α, IL-10 and IL-4 in patients with chronic liver disease treated by common treatment group and amino acid group

Before treatment, there was no significant difference in IGF-I, TNF - α and IL-10 between the two groups, which made the two groups comparable in these aspects. After treatment, IGF-I, TNF - α and IL-10 were significantly improved in both groups. The two therapeutic regimens are effective in improving IGF-I, TNF - α and IL-10. Compared with the normal group, the BCAA group improved IGF-I, TNF - α and IL-10 more significantly. The effect of amino acid treatment on IGF-I and cytokine levels was better than that of water-soluble vitamin.

This study found that both the common group and BCAA group could improve the liver function indexes (TBIL, ALT) and serum ALB in patients with chronic liver disease. We also found that for the improvement of TBIL and ALT indexes, there was no statistical significance between the two groups after treatment. The comparison between the two groups showed that the effect of the two treatment methods on the serum albumin level was significantly different, and the BCAA group was significantly better than the ordinary group.

These results indicate that branched chain amino acids can improve the energy metabolism disorder of chronic liver disease, increase the expression level of Alb mRNA in liver tissue and promote protein synthesis. Growth hormone can enhance the utilization of amino acids, and further promote the function of liver cells to synthesize albumin by regulating the expression of IGF-I and GHR, We observed the changes of IGF-I, TNF - α and IL-10 in patients with chronic liver disease. Observation found that in the two groups of treatment, the level of IGF-I in patients with chronic liver disease were increased, TNF - α, IL-10 levels were decreased, and the comparison between the two groups before treatment was statistically significant. Further analysis showed that the BCAA group had more significant effects on IGF-I, TNF - α and IL-10 than the normal group. Supplementation of BCAA in patients with chronic liver disease can reduce the secretion of endogenous growth hormone and further enhance the effect of exogenous growth hormone. These results indicate that BCAA group plays a more active role in improving IGF-I level, alleviating growth hormone resistance, and effectively regulating inflammatory cytokines.

5. Conclusion

Chronic liver disease had symptoms in the early stage, and no obvious abnormality was found in

the laboratory. Now more and more patients with chronic liver disease appear liver fibrosis, and in the late liver failure and then endanger the lives of patients. Therefore, early active prevention and treatment of chronic liver disease, timely intervention of these patients can prevent further deterioration of the disease, it is extremely important.

The experimental data in this paper are from patients with chronic liver disease admitted to the Department of Gastroenterology of our hospital from January 2019 to December 2019. This article mainly introduces the disorder of amino acid metabolism and branched chain amino acid in chronic liver disease. The clinical symptoms and signs, liver function, albumin, insulin-like growth factor-1, interleukin-10 and tumor necrosis factor before and after treatment were compared and analyzed. The results showed that: the clinical symptoms and signs, liver function and albumin of patients in the common group and BCAA group were significantly improved. Compared with the normal group, BCAA group increased appetite and edema of lower limbs by 15% and 47% respectively. The branched chain amino acid group compared with the ordinary group, branched chain amino acid in the treatment of albumin was significantly better than the ordinary group of water-soluble vitamins. After treatment, IGF-I, TNF - α and IL-10 were significantly improved in both groups. The effect of BCAA on IGF-I and cytokine levels was better than that of water-soluble vitamin. Therefore, the effect of branched chain amino acids in the treatment of chronic liver disease is far better than that with water-soluble vitamins.

Due to the error of the experimental method, the complex stress of the frame joints, and the limitations of the cast concrete samples, the experimental results may be affected. In this paper, only two kinds of materials, nano silica fiber concrete and PVA fiber concrete, are considered. The next step should be to consider whether there is better fiber concrete to improve the seismic performance of frame joints.

Due to the lack of experimental data collected in this paper, there are some limitations. Whether the duration of BCAA on symptoms, signs, liver function and related humoral factors in patients with chronic liver disease is different from that in normal group, it needs to be further improved. The next step should be to consider whether the combination of BCAA and production factors can better treat chronic liver disease.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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