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CLINICAL TRIALS STUDY

Outcomes of autologous bone marrow mononuclear cell transplantation in decompensated liver cirrhosis

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Abstract

AIM: To determine the long-term efficacy of autologous bone marrow mononuclear cells (BM-MNCs) transplantation in terms of improving liver function and reducing complications in patients with decompensated cirrhosis.

METHODS: A total of 47 inpatients with decompensated liver cirrhosis were enrolled in this trial, including 32 patients undergoing a single BM-MNCs transplantation plus routine medical treatment, and 15 patients receiving medical treatment only as controls. Forty-three of 47 patients were infected with hepatitis B virus. Bone marrow of 80-100 mL was obtained from each patient and the BM-MNCs suspension was transfused into the liver *via* the hepatic artery. The efficacy of BM-MNCs transplantation was monitored during a 24-mo follow-up period.

RESULTS: Liver function parameters in the two groups were observed at 1 mo after BM-MNCs transfusion. Prealbumin level was 118.3 ± 25.3 mg/L *vs* 101.4 ± 28.7 mg/L (P = 0.047); albumin level was 33.5 ± 3.6 g/L *vs* 30.3 ± 2.2 g/L (P = 0.002); total bilirubin 36.9 ± 9.7 mmol/L *vs* 45.6 ± 19.9 mmol/L (P = 0.048); prothrombin time 14.4 ± 2.3 s *vs* 15.9 ± 2.8 s (P = 0.046); prothrombin activity 84.3% ± 14.3% *vs* 74.4% ± 17.8% (P = 0.046); fibrinogen 2.28 ± 0.53 g/L *vs* 1.89 ± 0.44 g/L (P = 0.017); and platelet count 74.5 ± 15.7 × 10^9/L *vs* 63.3 ± 15.7 × 10^9/L (P = 0.027) in the treatment group and control group, respectively. Differences were statistically significant. The efficacy of BM-MNCs transplantation lasted 3-12 mo as compared with the control group. Serious complications such as hepatic encephalopathy and spontaneous bacterial peritonitis were also significantly reduced in BM-MNCs transfused patients compared with the controls. However, these improvements disappeared 24 mo after transplantation.

CONCLUSION: BM-MNCs transplantation is safe and effective in patients with decompensated cirrhosis. It also decreases the incidence of serious complications.

Key words: Autologous; Bone marrow mononuclear cells; Transplantation; Liver cirrhosis; Hepatitis B virus

Core tip: We aimed to study the efficacy of autologous bone marrow mononuclear cells (BM-MNCs) transplantation in terms of improving liver function and reducing complications in patients with decompensated cirrhosis. Liver function parameters were improved one month after BM-MNCs transfusion in cirrhosis patients,

firstly in prealbumin level, followed by albumin level, total bilirubin, prothrombin time, prothrombin activity, fibrinogen and platelet count. The efficacy of BM-MNCs transplantation lasted 3-12 mo as compared with the control group. However, these improvements disappeared 24 mo after transplantation.

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INTRODUCTION

Hepatitis B virus (HBV) infection is a major health care challenge in Asian countries including China. In some patients, HBV infection can lead to stepwise complications at a later stage of the disease, including liver cirrhosis, liver failure and hepatocellular carcinoma[1]. Decompensated liver cirrhosis is a critical condition due to its high morbidity and mortality[2]. Patients presenting with one or more of the symptoms such as jaundice, ascites, portal hypertension, gastrointestinal bleeding, and encephalopathy are considered to have decompensation[3]. Despite improvements in the management of liver cirrhosis, the overall outcome of the disease remains poor.

Orthotopic liver transplantation is by far the best treatment option for patients with decompensated cirrhosis; however, limitations such as a shortage of organ donors, surgical complications, post-transplantation rejection, and high cost of the procedure have made this treatment not easily available[4]. Therefore, the development of regeneration therapy for liver cirrhosis is urgently required.

Recent studies have indicated that stem cell therapy may be a potential alternative to liver transplantation. Autologous bone marrow mononuclear cells (BM-MNCs) transplantation has been reported to be safe and effective in several studies[5-10]. In the short-term, it improves liver function and Child-Pugh scores after 4-24 wk of therapy in both HBV infected and alcohol-induced cirrhosis. In liver biopsies of transplanted patients, increased alpha-fetoprotein and proliferating cell nuclear antigen expression are detected, suggesting that these patients have undergone partial liver regeneration processes[5-10]. A prospective cohort study by Peng *et al*[9] in HBV infected patients indicated that the short-term efficacy of BM-MNCs transfusion was favorable, but long-term outcomes were not markedly improved. At 192 wk of follow-up, there were no marked differences in the incidence of hepatocellular carcinoma (HCC) or mortality between the transfusion and control groups[9].

This method appears preferable in patients with both HBV infected and alcohol-induced liver cirrhosis. It may also have the potential to reduce the incidence of HCC and mortality[9]. The above results clearly indicate the advantages and disadvantages of this therapy; however, due to the geographic variation in the disease and the variations in treatment, it is not clear how long the effects may last following a single infusion plus a routine medical treatment regimen. In addition, it is unknown if BM-MNCs transplantation may reduce serious complications in cirrhotic patients and improve quality of life.

We aimed to determine the short- and long-term efficacy and safety of BM-MNCs transplantation in patients with decompensated cirrhosis receiving a normal treatment regimen with a focus on the incidence of complications during the study. The results showed that transplantation of autologous BM-MNCs is safe and effective in patients with decompensated cirrhosis. The beneficial effect seemed to last for at least 12 mo. This approach improves liver function, blood coagulation, and short-term quality of life, and reduces the incidence of serious complications. Therefore, repeated transplantation of autologous BM-MNCs may represent a routine therapeutic approach to improve the general condition of patients with decompensated cirrhosis.

MATERIALS AND METHODS

Patients

In this trial, 47 patients with decompensated liver cirrhosis were recruited. The patients were admitted to the Department of Gastroenterology at Henan Provincial People's Hospital from March 2009 to March 2011. Written informed consent was obtained from 32 patients after explaining the benefits and risks of the study and its complications. Fifteen patients declined the infusion and received only routine medical treatment. These patients served as controls. In the treatment group, 32 patients were treated with BM-MNCs plus a conventional internal medicine regimen including drugs for anti-HBV virus, liver cell protection, transaminase and jaundice reducing drugs. In the control group, patients only received the above conventional medical treatment without BM-MNCs infusion.

The treatment group included 30 patients with HBV infection and cirrhosis and two patients with alcoholic liver cirrhosis; in the control group, there were 13 patients with HBV infection and cirrhosis and two patients with alcoholic liver cirrhosis. The baseline clinical parameters of these patients are presented in Table 1.

The diagnosis of decompensated cirrhosis was made based on their Child-Pugh classification of grade B and C. Inclusion criteria included ultrasonographic evidence of liver cirrhosis with ascites, portal hypertension, low serum albumin (ALB), high total bilirubin (TBIL), prolonged prothrombin time (PT), normal alpha fetoprotein level, and no hepatocellular carcinoma on hepatic artery angiographic imaging. The exclusion criteria were as follows: combined heart and lung function abnormality, blood system diseases, acquired immunodeficiency

Table 1 Comparison of clinical and laboratory parameters between the two groups before transplantation

Parameter	Control	BM-MNCs	*P* value
Patient (*n*)	15	32	ND
Age (yr)	47.4 ± 11.1	46.4 ± 11.6	0.854[2]
Gender			
Male	9	20	
Female	6	12	0.869[1]
HBsAg			
Positive	13	30	
Negative	2	2	0.583[3]
Liver function			
Alanine aminotransferase (IU/L)	51.7 ± 14.5	53.2 ± 13.5	0.734[2]
Aspartate aminotransferase (IU/L)	63.7 ± 14.4	67.9 ± 16.7	0.404[2]
Serum albumin (g/L)	28.1 ± 2.8	27.9 ± 2.5	0.796[2]
Prealbumin (mg/L)	85.1 ± 23.5	83.5 ± 22.4	0.819[2]
Total bilirubin (mmol/L)	53.5 ± 17.9	52.2 ± 13.4	0.772[2]
Coagulation function			
Prothrombin time (s)	16.3 ± 3.0	16.9 ± 2.3	0.437[2]
Prothrombin activity	71.8% ± 19.4%	67.8% ± 15.0%	0.437[2]
Fibrinogen (g/L)	1.83 ± 0.53	1.81 ± 0.52	0.864[2]
Routine blood indices			
White blood cell counts ($\times 10^9$/L)	2.83 ± 1.07	2.73 ± 0.84	0.721[2]
Hemoglobin (g/L)	107.8 ± 11.4	105.9 ± 12.6	0.624[2]
Platelet counts ($\times 10^9$/L)	69.0 ± 16.6	67.2 ± 15.5	0.717[2]

Data are expressed as the mean ± SD. [1]Pearson χ^2 test; [2]*t* test; [3]Fisher's exact test. BM-MNCs: Bone marrow mononuclear cells; HBsAg: Hepatitis B surface antigen; ND: No data.

Table 2 Comparison of the occurrence of complications between the two groups

Patient group	*n*	Esophageal variceal hemorrhage	Hepatic encephalopathy	Spontaneous bacterial peritonitis	Hepatocellular carcinoma
Control	15	2	3	3	1
BM-MNCs	32	1	0	0	1
P value		0.235[1]	0.028[1]	0.028[1]	0.541[1]

[1]Fisher's exact test. BM-MNCs: Bone marrow mononuclear cells.

disease, malignant tumor, acute or chronic thrombosis of the hepatic vein or portal vein, a history of severe infection, refractory ascites, and moderate to severe hepatic encephalopathy or variceal bleeding during the last two months before enrollment. This study was approved by the Ethics Committee of Henan Provincial People's Hospital, Zhengzhou, China.

Preparation of BM-MNCs from patients

BM-MNCs were prepared following the procedure previously reported by Peng *et al*[9]. Briefly, marrow aspiration was performed in the bilateral posterior superior iliac spine under local anesthesia. Then 80-100 mL of human bone marrow was obtained with 1000 U/mL of Liquaemin as anti-coagulant. The bone marrow mononuclear cells were separated and purified by Ficoll-Paque density centrifugation[11]. The cells were placed into two 50 mL sterile centrifugal tubes, cells in the middle layer were collected, and an equal amount of physiological saline was added and mixed. The mixed cell suspension was gently added to the upper part of the Ficoll-Paque solution, followed by centrifugation at 2000 rpm for 20 min. Interphase-containing cells were obtained and washed three times with 10 mL of normal saline; cells were adjusted with physiological saline to a density of 1.0-11.2 × 10^{10}/L. Cell viability was determined by trypan blue staining.

Autologous BM-MNCs transplantation

On the day of transfusion, a femoral artery puncture was made and a catheter was inserted into the hepatic artery. Intrahepatic blood vessels were observed following the application of ioversol angiography. The prepared cell suspension was administered into the hepatic artery at a speed of 10 mL/h using a micro-pump.

Patient follow-up

Patients were followed for up to 24 mo after BM-MNCs transfusion. During this period, data on the patient's general condition and complications such as gastrointestinal bleeding, hepatic encephalopathy, spontaneous bacterial peritonitis, hepatocellular carcinoma, and changes in clinical symptoms and signs such as abdominal distension, physical strength, appetite, ascites, pleural effusion, lower extremity edema in the two groups were collected and recorded.

One week and 1, 3, 6, 12, and 24 mo after transplantation, the following blood biochemistry tests were performed: liver function tests: alanine aminotransferase (ALT), aspartate aminotransferase (AST), ALB, prealbumin (PA), TBIL; coagulation function tests: PT, prothrombin activity (PTA), fibrinogen (FIB); routine blood indices: white blood cell counts (WBC), hemoglobin, and platelet counts.

Statistical analysis

All data were analyzed by SPSS 17.0 software (SPSS Inc., Chicago, IL, United States) and a value of $P < 0.05$ was considered statistically significant. Data from clinical and biochemical analyses are expressed as mean ± SD and compared using the χ^2 and *t* tests. Fisher's exact test was used when appropriate.

RESULTS

Patient characteristics and complications

When we compared patient age, gender, liver function, blood coagulation function and routine blood indices, there were no significant differences between the two groups ($P > 0.05$, Table 1). The incidence of complications (Table 2) was monitored throughout the 24-mo follow-up period, and no significant differences were observed in the occurrence of esophageal variceal hemorrhage between the two groups. However, we noted a significant reduction in the occurrence of hepatic en-

Table 3 Levels of albumin, prealbumin and total bilirubin in the two groups at different time points after transplantation

Liver function	Group	1 wk	1 mo	3 mo	6 mo	12 mo	24 mo
Serum albumin (g/L)[1]	Control	29.2 ± 2.5	29.8 ± 2.8	30.3 ± 2.2	30.4 ± 3.3	29.7 ± 4.3	28.8 ± 3.4
	BM-MNCs	28.4 ± 2.7	30.2 ± 3.2	33.5 ± 3.6	33.9 ± 3.5	34.5 ± 4.2	30.7 ± 3.8
	P value	0.357	0.669	0.002	0.002	0.001	0.096
Prealbumin (mg/L)[1]	Control	92.5 ± 25.9	101.4 ± 28.7	111.1 ± 27.7	113.6 ± 26.5	115.0 ± 23.9	97.4 ± 17.7
	BM-MNCs	91.1 ± 23.2	118.3 ± 25.3	139.8 ± 25.9	138.1 ± 24.6	139.9 ± 25.3	107.9 ± 22.7
	P value	0.86	0.047	0.001	0.003	0.003	0.122
Total bilirubin (mmol/L)[1]	Control	51.3 ± 15.6	47.3 ± 16.5	45.6 ± 19.9	43.0 ± 20.8	38.7 ± 16.6	36.6 ± 14.2
	BM-MNCs	50.9 ± 12.6	44.2 ± 13.5	36.9 ± 9.7	32.2 ± 10.6	29.3 ± 9.7	32.7 ± 10.7
	P value	0.92	0.496	0.048	0.022	0.018	0.294

Data are expressed as the mean ± SD. [1]*t* test. BM-MNCs: Bone marrow mononuclear cells.

Table 4 Levels of prothrombin time, prothrombin activity and fibrinogen in the two groups at different time points after transplantation

Function	Group	1 wk	1 mo	3 mo	6 mo	12 mo	24 mo
Prothrombin time (s)[1]	Control	16.2 ± 2.8	16.3 ± 2.8	15.9 ± 2.8	15.7 ± 2.9	15.5 ± 2.9	15.7 ± 2.3
	BM-MNCs	16.8 ± 2.5	15.5 ± 2.5	14.4 ± 2.3	13.9 ± 2.1	14.0 ± 2.1	14.4 ± 2.1
	P value	0.472	0.311	0.046	0.019	0.051	0.06
Prothrombin activity[1]	Control	72.5% ± 17.8%	72.0% ± 17.7%	74.4% ± 17.8%	75.9% ± 18.2%	77.4%± 18.2%	75.6% ± 14.6%
	BM-MNCs	68.7% ± 16.0%	77.3% ± 15.7%	84.3% ± 14.3%	87.2% ± 13.3%	86.9% ± 13.5%	84.0% ± 13.6%
	P value	0.472	0.311	0.046	0.019	0.051	0.06
Fibrinogen (g/L)[1]	Control	1.90 ± 0.58	1.92 ± 0.57	1.89 ± 0.44	1.97 ± 0.40	1.99 ± 0.39	1.93 ± 0.28
	BM-MNCs	1.86 ± 0.55	2.12 ± 0.64	2.28 ± 0.53	2.51 ± 0.55	2.49 ± 0.51	2.11 ± 0.52
	P value	0.857	0.289	0.017	0.001	0.002	0.233

Data are expressed as the mean ± SD. [1]*t* test. BM-MNCs: Bone marrow mononuclear cells.

cephalopathy and spontaneous bacterial peritonitis in the treatment group compared with the control group. One patient in each group developed HCC during the 24-mo follow-up period ($P = 0.541$).

Liver function tests

One month after transplantation, ALB and PA levels in patients in the treatment group gradually increased. ALB levels in patients in the treatment group were significantly improved compared with those in the control group from 3 to 12 mo after transplantation (Table 3). The improvement in PA levels in the treatment group was significant at 1-12 mo after transplantation compared with the control group (Table 3). Autologous BM-MNCs transplantation also significantly decreased TBIL levels after 1 mo, and particularly at 3-12 mo after transplantation (Table 3). However, these differences were not observed at 24 mo after transplantation (Table 3). A comparison of liver function between baseline and 24 mo after transplantation indicated that there were no marked differences in ALT and AST levels between the two groups (data not shown).

Coagulation function test

Blood coagulation in patients in the treatment group began to improve one month after transplantation. PT levels in the treatment group gradually decreased and PTA levels gradually increased (Table 4). Significant differences in PT and PTA levels were observed in the treatment group at 3-6 mo after transplantation (Table 4). No significant differences were observed in PT and PTA levels at 12-24 mo after transplantation (Table 4). FIB levels in the treatment group gradually increased one month after transplantation, and particularly at 3-12 mo (Table 4). These differences were no longer observed 24 mo after transplantation (Table 4).

Routine blood tests

The peripheral WBC level in the treatment group was higher than that in the control group 6 mo after treatment; however, no significant differences in peripheral WBC levels were found between the treatment group and the control group at other time points (Table 5). Hemoglobin levels were significantly higher in the treatment group than in the control group at 3-6 mo after transplantation (Table 5). Platelet counts were significantly higher in the treatment group than in the control group at 3-12 mo after transplantation (Table 5).

DISCUSSION

Decompensated liver cirrhosis is an end-stage liver disease due to various causes of liver fibrosis, and a lack of safe and effective clinical treatments. Chronic infection with HBV and HCV, and alcohol consumption are major global causes of cirrhosis. Alcohol and HCV infection are common causes of cirrhosis in European, North American and other developed countries, whereas HBV infection is the major cause in many Asian and African countries, including China[12,13]. The majority of patients

Table 5 Levels of white blood cell counts, hemoglobin, and platelet counts in the two groups at different time points after transplantation

Routine blood indices	Group	1 wk	1 mo	3 mo	6 mo	12 mo	24 mo
White blood cell counts ($\times 10^9$/L)[1]	Control	2.82 ± 0.98	2.88 ± 0.95	2.85 ± 0.94	2.78 ± 0.96	2.69 ± 1.00	2.63 ± 0.92
	BM-MNCs	2.69 ± 0.80	2.96 ± 0.74	3.23 ± 0.80	3.44 ± 0.79	3.22 ± 0.77	2.94 ± 0.72
	P value	0.638	0.75	0.159	0.017	0.052	0.208
Hemoglobin (g/L)[1]	Control	108.7 ± 12.5	110.7 ± 13.3	112.8 ± 15.9	113.3 ± 15.2	114.5 ± 18.1	106.8 ± 14.3
	BM-MNCs	106.3 ± 12.5	112.4 ± 13.2	121.8 ± 12.0	124.1 ± 12.8	120.4 ± 11.9	110.8 ± 16.8
	P value	0.552	0.688	0.036	0.014	0.193	0.432
Platelet counts ($\times 10^9$/L)[1]	Control	68.9 ± 13.2	66.7 ± 13.8	63.3 ± 15.7	63.1 ± 13.9	62.1 ± 16.4	61.2 ± 15.6
	BM-MNCs	69.3 ± 16.1	70.1 ± 13.7	74.5 ± 15.7	75.8 ± 11.6	74.8 ± 14.7	67.7 ± 15.2
	P value	0.936	0.349	0.027	0.002	0.011	0.185

Data are expressed as the mean ± SD. [1]*t* test. BM-MNCs: Bone marrow mononuclear cells.

in the present study had HBV infection and cirrhosis.

BM-MNCs is a general term for single nucleus cells in the bone marrow, including mesenchymal stem cells (MSCs), hematopoietic stem cells, endothelial progenitor cells and stromal cells. BM-MNCs is a mixed cell population containing a variety of cellular components that can generate various cell types found in other tissues[14-16]. MSCs have the ability of self-renewal and pluripotency, they secrete a number of cytokines and growth factors to regulate cellular functions, including promoting liver regeneration, inhibiting inflammation and activation of liver astrocytes, blocking the production of and facilitating the degradation of excessive extracellular matrix to repair injured liver tissues[17,18]. Clinical trials have also shown the potential of MSCs to reduce liver fibrosis[19]. Transplantation of MSCs[19] and MNCs[6,8] has been explored in clinical trials to treat chronic liver disease with various efficacies. In the current study, we used a mixture of BM-MNCs to treat HBV infected cirrhosis, and the efficacy likely reflected the overall effects of these individual stem cells.

Recent reports have demonstrated the therapeutic effect of stem cell transplantation in liver cirrhosis. Kharaziha *et al*[8] reported that eight patients with end-stage liver disease did not experience discomfort and their liver function improved significantly after administration of MSCs. Kim *et al*[20] and Lyra *et al*[21,22] showed significant improvements in albumin and quality of life in patients with liver cirrhosis caused by hepatitis B. The results indicated that the mean serum bilirubin and international normalized ratio levels decreased, and the levels of serum albumin increased. Another study by Peng *et al*[9] confirmed the above results in a short-term study; however, a longer-term investigation suggested that these beneficial effects did not last more than two years, despite the fact that there was no increase in the incidence of HCC.

In our study, we observed the efficacy and safety of BM-MNCs transplantation in patients with decompensated cirrhosis and determined how long the efficacy lasted in order to find whether repeated transplantation of autologous BM-MNCs at regular time intervals might be an approach for improving the conditions of decompensated cirrhotic patients. The overall outcomes appear similar to those reported previously. In addition, it should be noted that this procedure significantly reduced serious complications such as hepatic encephalopathy and spontaneous bacterial peritonitis in the transfused patients. As the effect did not last more than two years, we consider that an annual treatment regimen may significantly improve the patient's general condition and quality of life.

The mechanism by which BM-MNCs contribute to hepatocyte regeneration or liver repair is still under investigation, trans-differentiation of MSCs into hepatocytes represents genomic plasticity in response to the microenvironment[23]. In a CCl_4 mouse model, persistent injury was found to induce efficient trans-differentiation of bone marrow cells (BMCs) into functional hepatocytes[24]. Green fluorescent protein (GFP)-transfected BMCs efficiently migrated into the peri-portal area of liver lobules after one day, and repopulated 25% of the recipient liver by four weeks in mice with liver cirrhosis induced by CCl_4. In contrast, no GFP-positive BMCs were detected in control mice with undamaged livers following transplantation. Transfused cells were first seen to differentiate into hepatoblasts and later became albumin-producing hepatocytes. The improved liver function following BMCs transplantation suggests that recipient conditions and microenvironments are key factors for successful cell therapy using BMCs[24].

At present, it is difficult to estimate which factors may affect the engulfment of BM-MNCs into the liver. Cells administered *via* peripheral veins achieved similar results to cells administered *via* the hepatic artery. In addition, the synergistic effect of fibroblast growth factor or granulocyte-colony stimulating factor can help mobilize BMCs, and will probably increase hepatic engulfment and improve efficacy. However, further research is required to optimize the protocol and explore the mechanisms.

One drawback in our experimental design is that there was no additional time point between 12 and 24 mo during the follow-up period; this may have resulted in missed patient information to determine the exact time point at which efficacy decreased after transplantation. However, it can be speculated that the improvement in patients' liver function and blood coagulation

was maintained for at least 12 mo or more. With regard to cirrhosis complications, no significant difference was observed in the occurrence of esophageal variceal hemorrhage and hepatocellular carcinoma between the two groups. Liver function and coagulation function in patients in the treatment group began to improve one month after transplantation. ALB, PA, PTA and FIB gradually increased; TBIL and PT gradually decreased. Significant alterations in these markers were observed between the treatment group and the control group at 3-12 mo after transplantation.

In addition, it should be noted that after transfusion, white blood cell count, hemoglobin and platelet count in patients in the treatment group increased gradually, which are signs of improved hypersplenism. During the trial, we found a reduction in spleen volume on ultrasonography in some patients in the treatment group (data not shown). Whether reduced portal hypertension occurs is currently under investigation.

Although clinical trials have shown some improvement in liver function, it must be remembered that the natural history of cirrhosis tends to be variable. The question of how to further optimize cell transplant type, the infusion method, the number of transplant operations and their impact on clinical efficacy remains to be answered. Future studies will be required to optimize BM-MNCs transplantation for the treatment of cirrhosis.

In conclusion, infusion of autologous BM-MNCs is safe and effective in patients with decompensated cirrhosis for at least 12 mo. This approach significantly improved liver function, blood coagulation and short-term quality of life, and reduced the incidence of serious complications, therefore can be considered a suitable regenerative therapy in patients with decompensated cirrhosis.

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COMMENTS

Background

Decompensated liver cirrhosis presents with several symptoms such as jaundice, ascites, portal hypertension, and encephalopathy. Decompensated liver cirrhosis is a critical medical condition due to its high morbidity and mortality. The bone marrow mononuclear cells (BM-MNCs) population is a mixed cell population that has self-renewal properties and the ability to produce multiple differentiation progenitors. Thus, in this study authors evaluated the efficacy of autologous BM-MNCs transplantation in patients with decompensated cirrhosis.

Research frontiers

Orthotopic liver transplantation is the final treatment for decompensated cirrhosis, however, donor shortage has resulted in this treatment being unavailable. Stem cell therapy may be a potential alternative to liver transplantation. A research hotspot is the development of safe and effective regeneration therapy to improve liver function and reduce the complications of decompensated cirrhosis.

Innovations and breakthroughs

The authors determined the long-term efficacy and safety of BM-MNCs transplantation in patients with decompensated cirrhosis. The efficacy was monitored during a follow-up period of 24 mo. The results of this study showed that this approach is a suitable therapy for patients with decompensated cirrhosis.

Applications

This study suggested that the transplantation of autologous BM-MNCs is safe and effective, and repeated transplantation of autologous BM-MNCs may represent a routine therapeutic approach to improve decompensated cirrhosis.

Terminology

BM-MNCs is the general term for single nucleus cells in the bone marrow, including mesenchymal stem cells, hematopoietic stem cells, endothelial progenitor cells and stromal cells. The BM-MNCs population is a mixed cell population containing a variety of cellular components which have self-renewal properties and the ability to produce multiple differentiation progenitors.

Peer review

The article presents a significant and valuable clinical research describing the short- and long-term efficacy of BM-MNCs transplantation in improving liver function and reducing the complications in decompensated cirrhosis patients.

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