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Abstract

Prospective Study on Efficacy of Oral Supplement of Branched-Chain Amino Acid Granules on the Nutritional Status of the Cirrhotics

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Background/Aims: A prospective comparative study was conducted to investigate the efficacy of orally administered branched-chain amino acids (BCAA) in cirrhotic patients. Methods: Forty-seven patients with liver cirrhosis of viral etiologies, whose hypoalbuminemia could not be corrected with adequate protein intake, were randomly assigned to either the BCAA group (n=31) or the control group (n=16). The selection criteria were ages between 16 and 70 years, patients whose Child-Pugh scores were less than 13 points and who were willing to participate in the study. Most patients (87.1%) belonged to Child-Pugh class B. Patients in the BCAA group received oral supplementation with branched-chain amino acid granules (12 g/day, each packet containing total 4 g of BCAA, i.e. leucine, 1904 mg; valine, 1144 mg; isoleucine, 952 mg) for 12 weeks. Patients had complete blood counts and chemistry at entry and once every month. Serum ferritin and amino acid concentrations in plasma were determined. Anthropometric parameters including body weight, body fat contents and body mass index were assessed at the beginning and at the end of the 3-month period. Results: In the BCAA group, there was a significant increment in plasma levels of isoleucine, valine (p < 0.001) whereas levels of aromatic amino acids did not show substantial change. Total BCAA concentration and BCAA/AAA (aromatic amino acid) molar ratio (Fischer's ratio) also increased significantly after the administration of oral BCAA (p < 0.001). In contrast, patients in the control group showed no significant change in assessed parameters. Conclusion: Oral supplementation of BCAA to cirrhotic patients improved several parameters reflecting nutritional status without causing encephalopathy or other serious adverse effects. (Korean J Hepatol 2001;7:432-438)

Key Words: Oral supplement, Branched-chain amino acid, Liver cirrhosis

◇ 2001 7 21 ; 2001 9 21 ; 2001 11 26
◇ Abbreviations: AAA, aromatic amino acid; BCAA, branched-chain amino acid.
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 16 -S internal standard
 , 70 , Child-Pugh L-norleucine (Sigma Chemical Co., St. Louis,
 13 가 3.5 g/dL USA) 20% sulphosaicylic acid 가
 , 3300 rpm 15
 . 0.2μm membrane
 filter (Waters, Millipore, MA, USA)
 3 , , 100μL Pharmacia Biotech (Cambridge, England)
 5 mg/dL post-column ninhydrin reaction system Bio
 20 autoloader amino acid analyzer
 , , 47 , (Body
 2:1 Mass Index) , (triceps skin
 16 , (BCAA fold), (mid-arm circumference)
) 31 . 34 , 13 .

Table 1. Changes in Anthropometric Parameters

Parameters	Control group		BCAA group	
	week 0	week 12	week 0	week 12
Body weight (Kg)	64.3±2.5	64.5±2.2	65.4±9.5	65.8±9.3
Body Mass Index (Kg/m ²)	24.3±1.2	23.7±0.7	23.4±3.2	23.7±3.3
Fat (%)	20.7±2.1	25.6±4.6	18.4±7.1	18.7±7.9
Lean Body Mass	50.5±1.9	49.7±4.4	53.2±7.0	53.4±7.1
Mid-arm muscle Circumference (cm)	28.3±0.9	28.3±0.8	27.4±0.5	27.6±0.5
Triceps skin fold (mm)	13.1±2.1	13.1±2.0	12.8±1.1	12.7±1.1

Data shown as Mean±S.D.

(kg) (m) , biomedical impedance (Body fat analyzer Model TBF-105: Tanita Co., Tokyo, Japan) , SPSS for Windows (SPSS inc., Chicago, IL, USA) , p 0.05 , tyrosine (p < 0.001). , BCAA Student's T paired T Fischer () test , test . 1.2 1.8 (p < 0.001, 3). histidine, alanine, glutamic acid (p < 0.001), lycine (p < 0.05) 가 가 . BCAA 4 , BCAA lean body mass, BUN, transferrin , BCAA , (, 가 가 1,2). , 가 가

Table 2. Changes of Blood Cell Count and Blood Chemistry

Parameters	Control group		BCAA group	
	week 0	week 12	week 0	week 12
Hb (g/dL)	11.8±0.7	12.8±0.8	11.3±1.5	12.1±3.9
Platelet (x 10 ³ /mm ³)	77.7±15.6	86.9±16.5	73.7±29.8	68.3±31.3
Glucose (mg/dL)	92.0±3.4	91.0±3.4	95.1±13.2	93.9±26.8
BUN (mg/dL)	8.4±1.0	9.1±0.9	12.5±4.1	14.0±4.3*
Creatinine (mg/dL)	0.9±0.1	0.9±0.1	1.0±0.2	1.0±0.2
Cholesterol (mg/dL)	149.1±11.5	146.2±10.5	144.3±33.4	136.6±26.7 [†]
Triglyceride (mg/dL)	80.4±7.2	81.6±8.7	65.7±24.9	64±21.8
Albumin (g/dL)	3.5±0.1	3.5±0.2	2.9±0.3	2.9±0.4
Transferrin (mg/dL)	179.0±11.2	164.6±9.3 [‡]	215.5±62.2	246.2±64.8 [§]

Data shown as Mean±S.D. *, p=0.028; [†], p=0.038; [‡], p < 0.05; [§], p=0.006. compared with pre-treatment values (at week 0) in each group.

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Table 3. Changes in Plasma Concentration of Amino acids

Parameters ($\mu\text{mole/L}$)	Control group		BCAA group	
	week 0	week 12	week 0	week 12
Leucine	89.9 \pm 1.2	91.8 \pm 0.8	94.0 \pm 5.4	75.0 \pm 3.5*
Isoleucine	62.4 \pm 1.9	59.2 \pm 0.9	60.1 \pm 4.8	128.1 \pm 6.7 [†]
Valine	167.9 \pm 3.1	166.8 \pm 3.0	173.1 \pm 8.2	282.9 \pm 11.9 [‡]
Phenylalanine	100.3 \pm 1.1	108.1 \pm 2.2	101.8 \pm 5.2	107.8 \pm 3.6
Tyrosine	171.5 \pm 1.6	170.3 \pm 1.7	177.8 \pm 10.5	172.0 \pm 3.6
Methionine	81.2 \pm 1.5	80.0 \pm 1.0	85.0 \pm 14.9	71.2 \pm 4.0
Threonine	176.1 \pm 8.7	186.6 \pm 4.4	178.9 \pm 9.6	165.4 \pm 6.1
Arginine	113.0 \pm 1.3	110.1 \pm 1.6	116.9 \pm 7.5	114.3 \pm 8.1
Histidine	95.4 \pm 1.9	91.8 \pm 0.9	98.1 \pm 3.8	120.0 \pm 3.9 [§]
Alanine	319.7 \pm 3.6	314.9 \pm 2.4	326.5 \pm 15.6	410.5 \pm 21.4
Asparagine	122.0 \pm 3.4	120.0 \pm 2.1	125.3 \pm 5.5	126.0 \pm 9.3
Aspartic acid	28.8 \pm 8.8	25.4 \pm 0.8	21.7 \pm 1.0	21.1 \pm 1.6
Glutamine	663.7 \pm 11.7	687.4 \pm 16.1	665.9 \pm 24.1	610.7 \pm 24.6
Glutamic acid	65.7 \pm 1.5	75.4 \pm 1.2	62.7 \pm 7.5	144.3 \pm 19.3 [¶]
Glycine	263.1 \pm 4.5	261.6 \pm 1.5	275.2 \pm 11.2	275.8 \pm 9.8
Lycine	163.6 \pm 1.8	162.1 \pm 1.3	169.9 \pm 8.5	191.8 \pm 8.2**
Serine	181.9 \pm 6.2	180.8 \pm 3.5	184.1 \pm 7.0	175.7 \pm 5.4
Proline	205.9 \pm 9.1	214.1 \pm 8.8	222.8 \pm 8.4	227.1 \pm 9.2
Citrulline	79.6 \pm 1.2	78.9 \pm 0.9	80.4 \pm 4.1	105.7 \pm 5.3 ^{† †}
Ornithine	121.4 \pm 1.6	120.6 \pm 2.1	122.1 \pm 4.0	153.0 \pm 10.3 ^{‡ †}
Taurine	90.8 \pm 4.7	89.6 \pm 5.8	94.8 \pm 3.0	114.7 \pm 11.6
-aminobutyric acid	22.4 \pm 1.8	21.6 \pm 1.7	22.7 \pm 2.3	37.6 \pm 2.8 ^{§ §}
Cystine	30.8 \pm 2.2	30.2 \pm 1.9	35.5 \pm 2.5	37.2 \pm 3.6
BCAA	320.2 \pm 3.6	317.5 \pm 3.5	327.2 \pm 15.0	486.0 \pm 19.3
AAA	271.7 \pm 2.2	278.4 \pm 2.1	279.6 \pm 15.2	279.8 \pm 10.2
Fischer's ratio	1.2 \pm 0.0	1.1 \pm 0.1	1.2 \pm 0.1	1.8 \pm 0.1 ^{¶ ¶}

AAA, aromatic amino acid; BCAA, brached-chain amino acid. Fischer's ratio = BCAA/AAA (molar ratio of AAA to BCAA). Data shown as Mean \pm S.D. (unit of plasma amino acid : mole/L) *,^{†,‡}, p < 0.01; ^{†,‡,§,¶,††,§§,¶¶}, p < 0.001; **, p < 0.05, compared with pre-treatment values (at week 0) in each group.

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 Fischer , Yoshida ,
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 246.2 mg/dL (p=0.006).
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 < 0.001).
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