



Nutrition, Fluid, and Electrolytes in Chronic Liver Disease

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Multiple variables, often interrelated, combine to affect the fluid, electrolyte, and nutritional status of patients with chronic liver disease. As poor prognostic indicators for patients with liver disease, early identification and appropriate management of malnutrition, ascites, and hyponatremia can improve patient morbidity and mortality.

Nutrition in Chronic Liver Disease

Malnutrition is prevalent in patients with chronic liver disease, with up to 75% of patients affected in one study of 300 cirrhotic patients.¹ Of those patients, 21% of Child A patients already showed moderate to severe malnutrition. Poor oral intake, inadequate synthesis of protein by the liver, and the hypermetabolic state in liver disease contribute to malnutrition^{2,3} (Table 1). Although malnutrition adversely affects outcomes in patients with chronic liver disease,⁴ it may not be recognized until late in disease progression.

Nutrition Assessment

The management of malnutrition begins with its identification through objective assessment of nutritional status, often difficult in the typically hypervolemic cirrhotic patient. The most recent European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines⁵ recommend applying the Subjective Global Assessment (SGA)⁶ (Table 2) and anthropomorphic measures (i.e., triceps skin-fold thickness, midarm circumference) to identify patients at risk for malnutrition and to quantify malnutrition with bioelectrical impedance analysis.

The SGA may underestimate the prevalence and severity of malnutrition in patients with cirrhosis.⁷ Some objective

variables used in nutrition assessment are of limited use in patients with chronic liver disease, because the disease process itself affects their values (i.e., albumin, ideal body weight). The ideal nutrition assessment method in patients with liver disease would include subjective and objective measures. To this end, modifications of the SGA to include objective variables have been developed, such as the Royal Free Hospital-Global Assessment and the Royal Free Hospital-Nutritional Prioritizing Tool. Although promising in terms of improved nutritional assessment, each requires further validation.⁸ In addition, another bedside test, the handgrip strength test, may be a better predictor of complications in malnourished patients with cirrhosis.⁹

Nutrition Recommendations

Caloric Intake and Requirements

For those patients with chronic liver disease who are found to be malnourished, oral and enteral nutrition are recommended as initial means to meet caloric needs. For those who cannot meet their caloric goals with oral supplements, tube feeds via nasogastric tube is recommended. Even though percutaneous gastrostomy tube placement is not recommended in patients with gastric varices or ascites, varices are not considered a contraindication to placement of flexible nasogastric tubes.⁵ Parenteral nutrition should be reserved only for those with moderate-to-severe malnutrition who absolutely cannot meet their caloric needs by oral or enteral routes.⁵

Daily caloric recommendations for patients with liver cirrhosis range from 25 to 40 kcal/kg/day. ESPEN and the American Society for Parenteral and Enteral Nutrition (ASPEN) recommendations vary slightly, with ASPEN

Abbreviations: ASPEN, American Society for Parenteral and Enteral Nutrition; BCAA, branched-chain amino acid; ESPEN, European Society for Clinical Nutrition and Metabolism; SGA, Subjective Global Assessment

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Potential conflict of interest: Nothing to report.

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doi: 10.1002/cld.526

**TABLE 1** Factors That Contribute to Malnutrition in Chronic Liver Disease^{2,3}

Inadequate nutrient intake
• Early satiety (ascites)
• Anorexia (nausea, vomiting, abdominal distention)
• Dysgeusia (zinc deficiency)
• Hepatic encephalopathy
• Restricted diet (low protein, low sodium, fluid restriction)
• Alcohol intake
• Socioeconomic barriers
Metabolic changes
• Hypermetabolic state
• Increased gluconeogenesis
• Insulin resistance
Malabsorption
• Portosystemic shunting (bowel wall edema, portal venous stasis)
• Bile acid deficiency
• Small-bowel bacterial overgrowth

TABLE 2 Subjective Global Assessment⁶

History
○ Weight change
• In past 6 months
• In past 2 weeks
○ Dietary changes
• If change, duration of change
• If intake decreased, characterize diet: suboptimal solid, full liquid, hypocaloric, starvation
○ Symptoms present >2 weeks
• None, nausea, vomiting, diarrhea, anorexia
• Functional status
• No dysfunction
• If dysfunction, duration (weeks) and degree (working suboptimally, ambulatory, bedridden, specific impairments)
• Primary diagnosis and presence of metabolic stress
• No stress, low, moderate, high
Physical examination
○ Characterize each as: normal (0), mild (1+), moderate (2+), severe (3+)
• Loss of triceps and chest subcutaneous fat
• Muscle wasting of quadriceps and deltoids
• Ascites
• Ankle edema
• Sacral edema
Subjective Global Assessment Rating
○ A = Well nourished
○ B = Moderately malnourished
○ C = Severely malnourished

recommendations accounting for the presence or absence of encephalopathy^{5,10} (Table 3).

Due to the fact that patients with liver disease have reduced capacity to store glycogen, the use of muscle glycogen stores, free fatty acid oxidation, and ketone body production all may increase, potentially causing loss of lean body mass. Timing of meals should therefore be closely monitored in patients with liver disease. Multiple meals spaced through the day, to avoid fasting longer than 3 to 6 hours at a time, and a bedtime snack high in complex carbohydrates helps minimize this muscle loss.¹¹

Protein Intake

A protein-restricted diet has historically been recommended to patients with chronic liver disease to prevent hepatic encephalopathy by avoiding an increase in serum

TABLE 3 Energy and Protein Recommendations in Chronic Liver Disease^{5,10}

Energy requirement
ESPEN: 35–40 kcal/kg/day
ASPEN:
• With acute encephalopathy: 35 kcal/kg/day
• Without encephalopathy: 25–35 kcal/kg/day
• Stable and malnourished: 30–40 kcal/kg/day
Protein requirement
ESPEN: 1.0–1.5 g/kg/day
ASPEN:
• With acute encephalopathy: 0.6–0.8 g/kg/day
• Without encephalopathy: 1.0–1.5 g/kg/day

TABLE 4 Summary of Nutrition, Fluid, and Sodium Recommendations for Patients With Chronic Liver Disease

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| <ul style="list-style-type: none"> • All patients with chronic liver disease should undergo a baseline nutritional assessment, repeated at routine intervals or with change of clinical condition^{5,8} • Enteral feeds through a nasogastric tube are indicated in patients who cannot reach caloric intake goals with oral supplements; parenteral feeds are reserved for patients who cannot reach caloric intake goals by oral or enteral routes • Optimal energy intake: 25–40 kcal/kg/day^{5,10} • Protein intake <ul style="list-style-type: none"> ○ Daily protein intake: 1.2–1.5 g/kg,^{5,8} 0.6–0.8 g/kg if acute encephalopathy¹⁰ ○ Small meals evenly distributed through the day and a bedtime snack of complex carbohydrates minimizes muscle loss³ ○ Branched-chain amino acid supplementation may help achieve daily protein goals in patients who are protein intolerant⁸ • Moderate sodium restriction (80–120 mmol sodium/day or 4.6–6.9 g salt/day) is a mainstay of therapy in ascites¹⁴ • Fluid restriction is not recommended until serum sodium decreases to <120–125 mmol/L¹⁵ |
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ammonia. Studies have not supported this hypothesis, and protein restriction may actually worsen malnutrition in patients with cirrhosis. The current recommendation for protein intake is 1.2 to 1.5 g/kg/day.^{5,8} Patients who cannot achieve their protein intake goals by dietary protein may benefit from branched-chain amino acid (BCAA) supplementation.^{5,8} BCAA supplementation may also have a beneficial effect in patients with hepatic encephalopathy.¹²

Fluid and Electrolyte Management in Chronic Liver Disease

Most patients with ascites caused by cirrhosis have an impaired renal handling of water that results in dilutional hyponatremia, the severity of which correlates directly with the severity of liver disease. Several factors contribute to hyponatremia in this setting, but systemic vasodilation, which leads to the inappropriate activation of antidiuretic hormone, promotes water retention.¹³ Both ascites and hyponatremia are poor prognostic factors for the patient with cirrhosis.

Sodium Restriction

The standard therapy of ascites secondary to cirrhosis includes a moderate sodium restriction (80–120 mmol



sodium/day or 4.6-6.9 g salt/day).¹⁴ More restricted sodium intake is not recommended because this may make food less palatable and actually contribute to malnutrition.¹⁵

Fluid Restriction

Chronic hyponatremia, associated with higher morbidity and mortality, is prevalent in patients with ascites. It is typically a hypervolemic hyponatremia, and in most patients fluid restriction does not need to be considered until hyponatremia is severe. Fluid restriction should be considered when sodium levels decrease to less than 130 mEq/L. Fluid restriction of 1 to 1.5 L fluid/day once serum sodium declines to less than 120 to 125 mEq/L is considered standard practice.^{15,16}

Conclusion

Table 4 summarizes the current nutrition, fluid, and sodium management recommendations for patients with

chronic liver disease. Although to date there is no evidence that nutrition support improves clinical outcomes,¹⁷ it is known that malnutrition, ascites, and hyponatremia negatively affect morbidity and mortality in patients with chronic liver disease. Frequent reassessment of these patients' fluid, electrolyte, and nutritional state with disease progression by their health care providers is important so that appropriate adjustments in management can be made as liver function changes. Ensuring adequate caloric intake and appropriate salt and fluid restriction may improve outcomes in patients with chronic liver disease.

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