Protein Energy Wasting in Hemodialysis Patients

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Introduction
Protein energy wasting (PEW) is a state of decreased body stores of protein and energy fuels, and is associated with diminished functional capacity, impaired quality of life, and increased morbidity and mortality in patients with CKD (1). The prevalence of PEW ranges from 30% to 70% among patients on maintenance hemodialysis. Here, we use a case study to discuss the diagnosis and treatment of PEW in patients on hemodialysis.

Case
A 52-year-old man with a medical history of hypertension and stage 5 CKD presents with progressive loss of kidney function, loss of appetite, and dysgeusia. His nutritional parameters are as follows: height, 5 ft 4 in; weight, 70.3 kg; body mass index, 26.5 kg/m²; his physical examination shows pedal edema; serum albumin, 3.3 g/dl (bromocresol green method); and a subjective global assessment shows mild PEW.

PEW can emerge in early CKD and the risk for development and worsening of PEW increases as CKD progresses. The causes of PEW in CKD are complex, including but not limited to inadequate nutrient intake and chronic inflammation (2). A preventive strategy is often difficult to formulate because of the complexity of the pathophysiology in these patients.

Dialysis is started with the hope of removing uremic toxins and helping to improve PEW. On dialysis, serum albumin trends, weight, and normalized protein nitrogen appearance are usually monitored monthly, and subjective global assessment and dietary interviews are performed every 4–6 months.

At 2–3 months after transitioning to dialysis, the patient is feeling better. His uremic symptoms are improving. His nutritional parameters are as follows: weight, 68 kg; body mass index, 25.7 kg/m²; his physical examination shows euvoema; serum albumin, 3.8 g/dl (goal >4 g/dl) (3); normalized protein nitrogen appearance, 0.9 g/kg per day; and a subjective global assessment shows mild to moderate PEW. His dietary intake diary and interview show that he is consuming 27 kcal/kg per day and 0.8 g/kg per day of protein.

As optimizing spontaneous oral intake is the first step in improving PEW, the patient receives education to help improve dietary intake. A multispecialty team approach is used in developing interventions for management of PEW in patients with hemodialysis. Physicians, registered dieticians, nurses, social workers, and psychologists play vital roles in providing a safe and effective nutritional strategy. Regarding dietary recommendations in patients on hemodialysis, an increased protein intake (approximately 1.2 g/kg per day) and total calorie intake of 30–35 kcal/kg per day are recommended (3). Every effort should be made to remove any dietary restrictions; patients need to be educated on calorie-dense foods and high biologic value protein, and on how to improve their oral intake. Dietary restrictions are recommended to limit dietary phosphorus or potassium intake. Dietary phosphorus correlates closely with total protein content, making protein-rich foods a main source of phosphorus. Thus, limiting dietary phosphorus indirectly limits protein intake. Educating patients about high protein and low phosphorus food options, cooking techniques to remove phosphorus from food, and encouraging the use of phosphorus binders helps liberalize dietary protein intake. Timely initiation of dialysis, ensuring an adequate nutrient intake by limiting dietary restriction, and early referral to a kidney dietician could help prevent inadequate nutrient intake and PEW. The dietician may need to educate both the patient and the family, and investigate if there are financial or other restrictions that limit access to food.

Over the course of the next years, the patient is relatively stable. He is compliant with his hemodialysis regimen, and is able to maintain nutritional parameters in acceptable ranges with intense dietary counseling.

Approximately 3.5 years after starting dialysis, the patient is admitted to a hospital, presenting with pneumonia. His nutritional parameters after hospital discharge are as follows: weight, 57 kg (down from 68 kg, approximately 17% weight loss); body mass index, 22 kg/m²; his physical examination shows temporal wasting; serum albumin, 3.1 g/dl; and a subjective global assessment shows moderate to severe PEW.

He is started on an oral nutritional supplement and receives encouragement to increase his dietary protein intake and consume calorie-dense foods to achieve a body mass index ≥23 kg/m². Mirtazapine and methylphenidate are added to his medication regimen.

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All patients with evidence of worsening PEW should be carefully evaluated for systemic non-nutritional causes of malnutrition. History and physical examination are essential elements of the evaluation and may reveal signs and symptoms of malignancy, depression, dementia, or sources of inflammation such as occult or overt infections that could lead to decrease in appetite and increased protein catabolism. A complete gastrointestinal workup is needed to make sure there are no physical or structural reasons (e.g., poor dentation, dysphagia, gastroparesis, etc.) for poor oral intake. Once non-nutritional causes have been addressed, intense dietary counseling should be provided. Oral nutrition supplements should be used when spontaneous oral intake is inadequate. A typical 8 oz of calorie-dense oral nutritional supplement is able to provide only approximately 6 kcal/kg per day and 0.28 g/kg per day of protein. As a result, it is important that oral nutritional supplements be used only as a supplement to spontaneous oral intake. An additional aspect of nutritional management is attention to glycemic control when adding nutritional supplements (e.g., oral nutritional supplement or intradialytic parenteral nutrition [IDPN]) in patients with diabetes who are on hemodialysis. Appetite stimulants are often used in patients on dialysis; however, there is scarce evidence for their efficacy and safety in this population.

Over the course of the next 4 months, there is no improvement in the patient’s nutritional parameters. His condition continues to worsen despite liberalization of diet and the use of an oral nutritional supplement. No other clinical causes for PEW are identified. His nutritional parameters are as follows: weight down to 55 kg from 57 kg (originally 68 kg, approximately 20% weight loss); body mass index, 20 kg/m²; his physical exam shows temporal wasting; serum albumin, 3.1 g/dl; normalized protein nitrogen appearance, 0.8 g/kg per day; and a subjective global assessment shows severe PEW. His dietary intake diary and interview shows that he is consuming 21 kcal/kg per day and 0.9 g/kg per day of protein (3,4,7,8). The advantages of starting IDPN are that it is given during the hemodialysis treatment, thus reducing risk of volume overload and avoiding adding an additional burden to the patient in terms of time commitment or need for an access port. The disadvantages of IDPN are increased risk for metabolic and electrolyte abnormalities, cost, and lack of data on improvement in clinical outcomes.

At 4 months after starting IDPN, there was only a small improvement in our patient’s nutritional parameters. IDPN was stopped and after intense counseling, the patient eventually consented to start enteral nutrition via a feeding tube. His PEW subsequently improved. We anticipate that he will receive a kidney transplant in the near future and we continue to provide intensive nutritional management to improve his nutritional status before transplant surgery.

In patients who are not meeting daily nutrition goals even with oral nutritional supplement, the placement of a feeding tube for enteral nutrition or daily total parenteral nutrition needs to be considered. Another group of patients in whom enteral nutrition or total parenteral nutrition needs consideration are critically ill patients on hemodialysis; this class of patient should be treated as intensive care patients (4).

In conclusion, patients with ESKD are at high risk for PEW, which is an independent risk factor for morbidity and mortality (9). Nutritional parameters need to be monitored closely. Improvement of oral nutrition and administration of an oral nutritional supplement are the initial steps in the management of PEW. Enteral nutrition should be applied as the next step. IDPN may have a role in a subset of patients but should only be used as supplemental nutrition. Total parenteral nutrition can be tried if these interventions fail. Clinical judgment and addressing individual patients needs remain key to the diagnosing and management of PEW.

Disclosures

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References


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