ADVANCES IN PRACTICE:

Strategies for optimizing nutritional intake and improving functional status in elderly patients undergoing maintenance dialysis therapy.

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Over the past three decades, there has been a significant increase in the number of elderly patients receiving maintenance dialysis therapy (1-3). In 2001, the median age of patients undergoing maintenance hemodialysis (MHD) was 65 years compared with 54 years in 1978 (1). Analysis of data from 398,940 United States Medicare patients initiating dialysis between 1995 and 2000 indicated that 51% of patients were 65 years or older (2). The health outcomes of these elderly patients may be impacted not only by their kidney disease, but also by life events that accompany the aging process. These events may include retirement and change in financial status, loss of spouse and bereavement, and change in social networks (3).

Aging is associated with increased incidence of malnutrition and changes in body composition (4,5). Age greater than 65 years is a strong predictor of malnutrition among MHD patients (6). During the aging process, poor protein intake and reduced levels of physical activity promote loss of skeletal muscle, called sarcopenia (5). This may lead to a decrease in physical function and contribute to the falls that commonly occur in MHD patients (7). Clearly, the elderly patient with chronic kidney disease (CKD) undergoing maintenance dialysis therapy belongs to a high-risk group that is a prime target for intervention by the renal care team.

Medical nutrition therapy is recognized as an effective strategy for managing chronic diseases in elderly patients, and the American Dietetic Association also promotes regular physical activity to decrease age-related morbidity in older adults (8). This column will review the recommendations for meeting protein and calorie needs in elderly patients with CKD undergoing MHD, and the role of exercise in improving health and physical function in this population.

The National Kidney Foundation Kidney Disease Outcomes Quality Initiative (NKF K/DOQI) Clinical Practice Guidelines for Nutrition in Chronic Renal Failure recommend a dietary protein intake of 1.2 g/kg body weight/day for clinically stable MHD patients and 1.2-1.3 g/kg body weight/day for clinically stable chronic peritoneal dialysis (CPD) patients (9). At least 50% of the dietary protein intake should be of high biological value to maintain protein balance. This is the recommended intake that is considered to be the minimum amount that will maintain neutral or positive nitrogen balance in the vast majority of stable MHD patients. In addition, a daily energy intake of 30-35 kcal/kg body weight/day is recommended for MHD and CPD patients 60 years or older.

Despite these recommendations, many elderly patients with CKD undergoing MHD are at high nutritional risk because their dietary protein and energy intake is inadequate (2,4,6). In a recent study of 37 stable MHD patients, dietary intake was measured on one dialysis day and two non-dialysis days using three-day diet diaries (10). When intake of protein and energy was calculated and averaged for each patient, 70% had intakes lower than recommended by the NKF K/DOQI Guidelines (9). The age of patients with inadequate protein and energy intake was significantly higher (62.1±10.4 years) than patients who met their protein and energy needs (37.0±20.8 years).

The results of this study confirm findings from an earlier cross-sectional analysis of 1,397 MHD patients enrolled in the Hemodialysis (HEMO) Study (11). Two-day diet recalls obtained on one dialysis day and one non-dialysis day were analyzed for dietary protein and energy intake. Mean dietary protein intake for older patients (age ≥65 years) was 0.91±0.33 g/kg adjusted body weight/day and 42% of these patients had protein intake <0.8 g/kg/day. Older patients also had low mean dietary energy intake (21.9±7.5 kcal/kg/day). Assessment of indicators of nutritional and functional status during this study revealed that older patients had significantly lower serum albumin levels and a significantly higher degree of physical disability than patients who were younger (age <50 years) or middle-aged (age 50-64 years).

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These findings may be related to poor dentition, prescription of multiple medications and taste dysfunction, all of which occur commonly in the aging population. Loss of dentition and/or wearing poorly fitting dentures contributes to poor nutritional status and underscores the need for routine preventive and corrective intervention by a dentist and dental hygienist (3). Individualization of drug therapy in elderly patients is particularly important to maximize effectiveness and decrease the need for multiple medications which can result in taste changes, nausea and appetite loss (3).

Changes in peritoneal membrane characteristics may further impact nutritional status in elderly patients undergoing CPD. In a study designed to investigate changes in nutritional status and peritoneal membrane transport characteristics with aging, 229 non-diabetic patients undergoing continuous ambulatory peritoneal dialysis (CAPD) were assigned to three groups: elderly (age ≥65 years), middle-aged (50-65 years) and young (age <50) (12). Although protein catabolic rate (PCR) did not differ significantly among the groups, mean serum albumin level was significantly lower. This may be attributed to the significantly higher peritoneal area and plasma protein losses across the peritoneum in the elderly group compared with middle-aged and young groups.

Findings from these studies emphasize the importance of increasing protein and energy intake in elderly patients with CKD undergoing MHD or CPD. Recommendations for optimizing protein and energy intake in this population include aggressive nutrition counseling, use of oral supplements, tube feeding and intravenous nutrition (2,9).

Elderly patients often have difficulty managing their nutrition intake at home and may lack the support needed to maintain adherence with interventions made by health care professionals (13). Preparation and delivery of cook-chilled meals consistent with renal nutrition guidelines for protein, energy, potassium, phosphorus and sodium may be helpful for patients with CKD undergoing maintenance dialysis therapy. However, while there is evidence that these foods are favorably accepted by users, their impact on health outcomes has not been investigated.

In another study, 80 non-renal patients age ≥75 years were randomized into a control group or a group receiving 200 ml oral supplement (500 kcal, 21 g protein) daily during and after hospitalization (14). Two months after hospital admission, significant weight loss had occurred in the control group but not in the supplemented group. The NKF K/DOQI Clinical Practice Guidelines for Nutrition also promote the use of high energy oral supplements to help patients with CKD meet recommended energy intake (9).

Results from a study of malnourished MHD patients indicate that providing oral supplements early in the course of malnutrition is more efficient and cost-effective than waiting until nutritional status has declined significantly (15). Patients with mild hypoalbuminemia (serum albumin 3.5 – 3.7 g/dl) were randomly assigned to control and experimental groups. The control group (mean age 58±8.6 years) received nutrition counseling to liberalize protein and calorie intake while the experimental group (mean age 64±10 years) received nutrition counseling and oral supplements (free of charge) to increase protein intake to 1.2 g/kg/day. Patients with moderate to severe hypoalbuminemia (serum albumin 2.5 – 3.4 g/dl) were assigned to a comparison group (mean age 68±10.5 years) and received one to three cans daily of oral supplements, which were provided by the patient's insurance plan or purchased by the patient.

During the six-month treatment phase, significantly more patients reached nutritional repletion, defined as serum albumin ≥3.8 g/dl for two consecutive months, in the control and experimental groups (57% and 50% respectively) than in the comparison group (7%). Overall, nutritional repletion occurred more quickly in the experimental group (3.2±1.7 months) than in the control group (3.5±1.2 months). Furthermore, during a three-month follow-up period, patients in the experimental group were much more likely to maintain nutritional repletion or continue to improve (61%) than patients in the control group (14%). This data suggests that early intervention with oral nutritional supplements helps larger numbers of patients to improve and maintain their nutritional status over a longer period of time.

Evidence suggests that oral supplements containing branched-chain amino acids (BCAA) may be particularly helpful in improving nutritional status in elderly patients on MHD (16). Twenty-eight malnourished MHD patients with ages greater than 70 years were randomly assigned

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to receive either placebo or BCAA supplement three times daily for six months, followed by the opposite treatment for six months. Change in nutritional status during the study period was evaluated using serum albumin concentration, body fat percentage and lean body mass. Dietary protein and energy intake was measured using seven-day diet records. Consumption of BCAA supplement resulted in rapid improvement in appetite and dietary protein and energy intake, which persisted throughout the supplementation period. Mean serum albumin increased significantly from 3.31 to 3.93 g/dl after three months, and anthropometric measurements improved significantly between three and six months. Dietary protein and energy intake and serum albumin concentration gradually decreased after BCAA supplementation was discontinued, but remained above baseline values. However, anthropometric parameters did not decrease. Thus, oral BCAA administration appears to have a rapid and sustained positive impact on nutritional status in elderly patients undergoing MHD.

Another study on elderly MHD patients showed beneficial effects of prolonged intradialytic parenteral nutrition (IDPN) on nutritional status (17). Ten non-diabetic patients age greater than 70 years on MHD for two years or more received IDPN containing glucose, essential amino acids and lipid emulsion during scheduled dialysis treatments for one year. Eighteen patients who did not receive IDPN served as the control group. Nutritional status was evaluated by measuring body mass index, triceps skinfold thickness, mid-arm circumference, mid-arm muscle circumference and serum albumin, transferrin and total lymphocyte count. Dietary intake of protein and calories was also determined. Serum albumin, transferrin and total lymphocyte count began to increase significantly after three months and anthropometric data began to increase significantly after six months of IDPN therapy. Patients who did not receive IDPN showed gradual decreases in all nutritional indices during the study period.

Appetite, mean protein and energy intake, estimated dry weight and serum albumin level in MHD patients may all increase as a result of participating in intradialytic exercise programs (18,19). Non-renal patients age ≥70 years and living at home also show significant improvement in balance and decreased incidence of falls when they exercise weekly (20). A recent study of falls in MHD patients with a median age of 70.9 years identified older age as an independent risk factor for falling and concluded that this population is a priority target for interventions, including exercise programs (7).

Functional disabilities and falls are linked to sarcopenia, the loss of muscle mass with aging (8). Strength training using progressive resistance training is regarded as the best intervention for slowing down or reversing sarcopenia and seems to be especially effective in reducing risk of falls (21). Exercise training in patients undergoing MHD increases the ability of muscles to use oxygen more efficiently, resulting in improved exercise capacity (22). Patients who participate in aerobic exercise and resistance training also show improved muscle strength and physical functioning (23-25). In these studies, patients participated in progressive resistance quadriceps and hamstring exercises, and trained on cycle ergometers.

A recent study suggests that if physical activity in the dialysis population is to be effective in improving their survival, patients need to exercise up to four to five times weekly (26). However, 56% of patients in a national cohort reported exercising less than once a week. Exercise programs that can be performed during dialysis improve participation rate, especially among elderly patients (27). Intradialytic exercise programs consisting of endurance training with a bed bicycle ergometer, gymnastics to increase muscle strength, flexibility and coordination, and relaxation techniques improve functional capacity even in very old patients.

Health outcomes in elderly patients undergoing maintenance dialysis therapy are affected by poor nutritional status and loss of skeletal muscle. Early intervention to increase protein and calorie intake via nutrition counseling and oral supplements, especially those containing BCAA, have been shown to improve biochemical and anthropometric parameters. Provision of intradialytic exercise programs also show promise as a means of improving patients' functional status.

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