Protein in pre-dialysis patients

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GUIDELINES

No recommendations possible based on Level I or II evidence

SUGGESTIONS FOR CLINICAL CARE

(Suggestions are based on Level III and IV evidence)

- **For patients with progressive chronic kidney disease (CKD), who receive a protein-restricted diet, the protein content should not be lower than 0.75 g per kilogram ideal body weight (IBW) per day. The protein should be of at least 50% high biological value. An energy intake of at least 35 kCal/kg IBW/day to minimise protein-energy malnutrition must accompany a low protein diet. (Level II evidence)**

- **CKD patients should not commence a lower protein diet until any plasma acidosis is corrected. (Level III evidence)**

It is recommended 15%–20% of daily energy intake is in the form of protein. Over 50% of this protein should be of high biological value (see Appendix).

Low protein diets may increase the risk of zinc, selenium, and some B vitamin (riboflavin, pyridoxine, B_{12}) deficiencies.

It is important to appreciate that hypoalbuminaemia is not necessarily synonymous with malnutrition. Patients may have a low plasma albumin concentration due to decreased albumin synthesis or because they are acutely unwell or have evidence of an acute phase response, suggesting an underlying inflammatory (and therefore catabolic) process.

In some populations, the protein portion of the daily energy intake (DEI) exceeds 20%–25% (some 2g/kg/24 hours). Protein restriction diets below the level of 1.2 g/kg lean body weight/24 hours may be impracticable to implement.

Between 50% and 66% high biological protein content has been recommended or used (Appendix). This recommendation is to ensure the limited protein taken is maximally utilised for its amino acid composition, and not for energy. It is imperative that adequate energy is consumed with the protein restriction diet to avoid protein-energy malnutrition (see Suggestions for Clinical Care in the 'Energy intake in pre-dialysis patients' guideline).

Background

Moderate to severe malnutrition appears to be common in patients undergoing maintenance dialysis, including peritoneal dialysis (Degoulet et al 1982, Acchiardo et al 1983, Lowrie & Lew 1990, Maiorca et al 1993, Avram et al 1994, Jones 1994, Pollock et al 1995, Ikizler et al 1995, Bergstrom & Lindholm 1993). Malnutrition is commonly seen as the patient commences dialysis. Often the caloric intake is inadequate in the latter stages of CKD (pre-dialysis), with generalised lethargy, anorexia, mood changes and metabolic acidosis occurring. A lack of caloric intake results in protein catabolism for energy, reduced muscle mass, and protein-calorie malnourishment. This complication is of increasing concern, since inadequate nutrition is an important factor in patient mortality.

The purpose of this guideline is to summarise the available evidence that assesses whether the percentage of dietary protein intake per day is associated with mortality or morbidity.

Search strategy

Databases searched: MeSH terms and text words for kidney disease were combined with MeSH terms and text words for dietary proteins then combined with the Cochrane highly sensitive search strategy for randomised controlled trials and search filters for identifying prognosis and aetiology studies. The search was carried out in Medline (1996 – November Week 2, 2003). The Cochrane Renal Group Trials Register was also searched for trials not indexed in Medline.

Date of searches: 27 November 2003.

What is the evidence?

No randomised controlled trials (RCTs) are available on this topic.

Prospective studies:
The safety of low protein diets was assessed in an analysis of patients in the Modification of Diet in Renal Disease (MDRD) study (Kopple et al 1997, Klahr et al 1994). In this trial, subjects were randomised to a usual protein diet (1.3 g/kg per day), a low protein diet (0.58 g/kg per day) or a very low protein diet (0.3 g/kg per day supplemented with a keto acid-amino acid mixture at 0.28 g/kg per day), based on their glomerular filtration rate (GFR). At a mean follow-up of 2.2 years, a low protein intake was not associated with increased rates of mortality, hospitalisation or malnutrition. However, lower levels of protein ingestion were associated with diminished energy intake and significant but small absolute declines in serum transferrin, body weight, percent body fat, and arm muscle area. As a result, although protein restriction may be safe for two to three years, declines in some nutritional indices are observed. The baseline dietary energy intake in this study can be considered inadequate for the nutritional needs of the nondialysed patient since it has been suggested that their energy expenditure and requirements are not different compared with the normal population. Thus, careful monitoring must be maintained if such diets are prescribed to avoid malnutrition or any other detrimental effects.

One other study (Ihle et al 1989), reported the need for careful monitoring of nutritional parameters to avoid malnutrition, when a low protein diet forms part of the patient's therapy. One author (Mitch 1991) recommends that at least 60% of the ingested protein must be of high biological value.

Patients with severe renal failure (mean GFR = 13 mL/min), on a protein-restricted diet and with mild plasma acidosis (17 mmol/L) experience increased skeletal muscle breakdown and decreased urinary nitrogen loss. Correction of the plasma bicarbonate level to normal with oral bicarbonate and dietary protein restriction prevents this muscle breakdown (Williams et al 1991).

In the pre-dialysis phase, an analysis of the diet by a skilled renal dietician should occur. Modification of the diet content so that at least 0.6 g/kg IBW/day protein is eaten, with at least 50% of the protein being of high biological value. Over a prolonged period of such dietary intervention (several years), subtle changes in the muscle mass or body composition may occur at 0.6 g/kg IBW/day. The studies have varying amounts of protein intake per kg IBW, and varying high biological value (HBV) protein percentage. The grounds for this range of variation are not always clear. If a protein-restricted diet is implemented, then adequate calorie intake is imperative.

Nitrogen balance is adversely affected by acidosis, which should be corrected to a plasma bicarbonate > 22 mmol/L prior to instigation of a protein-restricted diet (see Suggestions for Clinical Care in 'Acidosis in pre-dialysis patients' guideline).

Summary of the evidence

There are no RCTs.

What do the other guidelines say?

Kidney Disease Outcomes Quality Initiative:
For individuals with chronic renal failure (GFR < 0.42mL/sec) who are not undergoing maintenance dialysis, the institution of a planned low-protein diet providing 0.6 g protein/kg/d should be considered. For individuals who will not accept such a diet or who are unable to maintain adequate DEI with such a diet, an intake of up to 0.75 g protein/kg/d may be prescribed.

British Renal Association:
High biological value protein diet restricted to a total protein intake of 0.8–1.0g/kg/24 hours, with adequate energy intake (at least 35 kCal/kg ideal body weight/24 hours), supervised by a suitably trained renal dietician.

Very low protein diets (less than 0.5 g/kg/24 hours) are not recommended, for the risk of protein malnutrition from negative nitrogen balance.

European Dialysis & Transplant Nurses Association/European Renal Care Association:
The dietician/nutrition advisor will advise the pre-dialysis patient on a dietary protein intake of 0.6–1.0g/kg IBW/day for active, non-catabolic patients.

Guidelines should be tailored to the local dietary environment and pragmatically applied. Very restricted protein diets (< 0.5 g/kg/24hrs) require supplements which may be expensive. Prolonged protein restriction may lead to subtle changes in nutritional status (Klahr et al 1994), and studies have looked at different levels of protein restriction. To avoid protein malnutrition or other subtle nutritional problems, a higher (and presumed safer) protein minimum of 0.75 g/kg per day is recommended in these guidelines, when there is moderate renal impairment (GFR < 30 mL/min). This guideline recommends a minimum to avoid malnutrition rather than a range (BRA guidelines).

Implementation and audit

Protein-restricted diets must be prescribed in conjunction with adequate energy intake. These require significant skill, expertise and time resources, and should not be embarked upon without the supervision of a suitably skilled renal dietician.

Suggestions for future research

Examine the effect of a high protein diet on the progression of renal dysfunction.

References

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Appendix

Table 1 Daily protein intake recommendations for conservative care/pre-dialysis chronic kidney disease patients*

Nutritional Body					
	ADA/RPG	**NKF/ K-DOQI**	**BDA/ RNG**	**EDTNA/ ERCA**	**ESPEN**
Pre-ESRF/ conservative (g protein/kg IBW/day)	0.6–1.0	0.6–0.75	0.6–1.0	0.6–1.0	0.55–0.6
% High biological value protein	50%	> 50%	60%	> 55%	66%

ADA/RPG American Dietetic Association
NKF/K-DOQI National Kidney Foundation/K-DOQI guidelines subgroup
BDA/RNG British Dietetic Association/Renal Nutrition Group
EDTNA/ERCA European Dialysis and Transplant Nurses Association
ESPEN European Society of Parenteral and Enteral Nutrition

* All values in g protein/kg ideal body weight.