Clinical Nutrition ESPEN xxx (2017) e1–e5

Contents lists available at ScienceDirect

Clinical Nutrition ESPEN

journal homepage: http://www.clinicalnutritionespen.com

Original article

Effect of an intradialytic protein-rich meal intake in nutritional and body composition parameters on hemodialysis patients

Cristina Caetano [a, b], Ana Valente [a], Francisco Jorge Silva [b], Jorge Antunes [b], Cristina Garagarza [a, *]

[a] Nephrocare Portugal, Nutrition Department, Lisboa, Portugal
[b] Nephrocare Grândola, Portugal

ARTICLE INFO

Article history:
Received 27 March 2017
Accepted 12 April 2017

Keywords:
Nutritional status
Hemodialysis
Protein intake
Intradialytic meal
Body composition

SUMMARY

Background and aims: Protein intake is a key point to maintain an adequate nutritional status in hemodialysis (HD) patients. There are some studies that confirm the positive influence of intradialytic oral nutritional supplementation in several nutritional parameters in HD patients. The aim of this study was to evaluate the effect of an intradialytic protein rich meal in nutritional and body composition parameters on HD patients.

Methods: This was a 6-months single center non-randomized study with 99 patients in HD from one *Nephrocare* dialysis unit in Portugal. Patients in the intervention group (IG) presented one albumin value ≤ 3.8 g/dL in the two measurements prior to the beginning of the study. The IG ate a protein rich meal during each treatment. The control group (CG) continued to eat their usual snack brought from home. Albumin, nPCR, potassium, phosphorus, C-reactive protein (CRP), dry weight and body composition were measured at baseline and at the end of the study.

Results: Patient's mean age was 69.9 ± 12.9 years and HD vintage, 60.0 ± 50.5 months. Both groups were similar at the start of the study, except in albumin ($p = 0.019$). After the intervention, protein intake increased in the IG ($p = 0.001$). Albumin decreased in both groups but this difference was higher and only statistically significant in the CG ($p = 0.039$). Regarding body composition, in the CG, the fat tissue index (FTI) ($p = 0.022$) and the lean tissue index (LTI) ($p = 0.003$) diminished after the 6 months of the follow-up. However, in the IG the LTI value also reduced ($p = 0.008$) but FTI increased ($p = <0.001$) at the end of the study. There were no statistically significant differences on dry weight, potassium, phosphorus, and CRP.

Conclusion: Apart from the effect on protein intake, the importance of this study relies on the positive changes in regard to patient's body composition obtained after 6 months of an intradialytic intake of a protein rich meal during the HD treatment. This type of intervention can contribute to ameliorate patient's nutritional status without a negative effect on other parameters.

1. Introduction

Protein intake is a key point to maintain an adequate nutritional status in hemodialysis (HD) patients. There are some studies that confirm the positive influence of intradialytic oral nutritional supplementation, including protein, in several nutritional parameters in HD patients [1–6].

The protein loss induced by the HD treatment can contribute to the protein energy malnutrition [5]. These protein losses can be due to the clearance of plasma amino acids by the dialysis treatment *per se* or to the abnormal protein metabolism during the HD session [7,8]. Overall, three sources of amino acid loss from the plasma have been described: amino acid oxidation, amino acid loss into dialysate and amino acid conversion to protein [8].

The HD treatment is a catabolic event: it decreases circulating amino acids, accelerates rates of whole body and muscle proteolysis, promotes muscle release of amino acids, and enhances net whole body and muscle protein loss and increases resting energy

* Corresponding author. Rua Prof. Salazar de Sousa, Lote 12, 1750-233 Lisboa, Portugal.
E-mail address: cgaragarza@hotmail.com (C. Garagarza).

http://dx.doi.org/10.1016/j.clnesp.2017.04.003
2405-4577/

expenditure (REE) [8]. Compared to healthy subjects the increase of REE in HD patients raises from 8 to 16% [9].

It has been reported that some HD patients seem to lose their appetite and reduce their protein and energy intakes spontaneously [9]. This situation can make it difficult to fulfill their daily nutritional requirements and thus promote the development of protein energy malnutrition.

Veeneman et al. has described that in HD treatment days, patients who did not eat during the treatment presented a more negative protein balance comparing to a non-dialysis day. The authors of this study reinforced that a consumption of a protein-energy enriched meal during HD resulted in a positive balance, restoring the whole protein balance completely [7]. Besides this, it has been pointed out that the improvement of the nutritional status with the provision of oral nutritional supplements during HD treatment can increase HD patient's compliance and satisfaction [1].

The purpose of this study was to evaluate the effect of an intradialytic protein rich meal in biochemical and body composition parameters on HD patients.

2. Materials and methods

2.1. Subjects

At the beginning of this study, 99 HD patients were selected. All patients ate a meal during the dialysis treatment. At baseline, patients were divided into two groups. The inclusion criteria for the intervention group (IG) were the presence of at least one serum albumin concentration $\leq$3.8 g/dL in the last two measurements (nonconsecutive months) before the start of the study, acceptance to consume the proposed meal during the treatment, age $\geq$18 years and 3 times weekly in-center HD for $\geq$3 months (with an online hemodiafiltration technique). Patients who presented chewing and/or swallowing difficulty were not included in the study and those who did not meet the requirements mentioned for the IG were included in the control group (CG).

Six patients dropped out during the study period due to non-compliance, taste dislike or gastrointestinal intolerance associated with the meal. Additionally, during the study, one patient from the CG was transplanted and one patient from the IG stopped doing HD. Therefore, 91 patients were considered for this study. The number and the causes of hospitalizations were registered during the study period.

All patients were dialyzed with high-flux (Helixone®; Fresenius Medical Care) membranes and ultrapure water in accordance with the criteria of International Organization for Standardization regulation 13959:2009 – Water for hemodialysis and related therapies.

2.2. Study design

This was a 6-month single center non-randomized study with maintenance HD patients.

Patients in the IG (n = 42) received a meal after one and a half hour of the beginning of each treatment. The meal composition was 160 mL of a drink rich in high biological value protein (65% – pasteurized egg albumin, milk proteins and whey proteins – strawberry or vanilla flavor) and an egg sandwich. Nutritional facts of the meal are detailed in Table 1. All the patients included in the CG (n = 49) continued to eat the snack that they usually brought from home (Table 1). The nutritional facts of each meal were analyzed and a mean value ± SD is presented in Table 1.

This study was approved by the responsible of the Local Ethical Board.

Table 1
Nutritional facts of the meal given to the intervention group and of the control group meal.

Per serving	IG			CG
	Drink (160 mL)	Egg sandwich	Total	Meal
Calories (kcal)	97.6	322.7	420.3	340.5 ± 14.2[a]
Total fat (g)	0.5	9.8	10.3	7.0 ± 1.3[a]
Protein (g)	15.4	15.6	31.0	14.3 ± 4.6[a]
Carbohydrates (g)	7.4	42.1	49.5	53.8 ± 6.3[a]
Sodium (mg)	400	407.4	807.4	790.1 ± 34.9[a]
Phosphorus (mg)	144	131.4	275.4	250.7 ± 111.5[a]
Potassium (mg)	224	255.7	479.7	316.9 ± 64.3[a]

[a] Mean value ± SD.

2.3. Variables of interest

Age, gender, HD vintage, dry weight, dialysis adequacy, presence of diabetes, body mass index (BMI), calcium, phosphorus, potassium, calcium–phosphorus product, serum albumin, C reactive protein (CRP), normalized protein catabolic rate (nPCR), fat tissue index (FTI), lean tissue index (LTI), body cell mass (BCM) and relative overhydration (overhydration/extracellular water [OH/ECW]) were recorded at baseline (May 2015) and at the end of the study (November 2015). The clinical parameters were evaluated, in the middle week session, at baseline and at the end of the study.

Albumin mean value of the two measurements before the initiation of the nutritional intervention was used for baseline values. The cut-off set for albumin (3.8 g/dL) was defined according to the ISRNM criteria for the diagnosis of the wasting syndrome [10].

2.4. Body composition measurements

In all of the patients, body composition was assessed through bioimpedance spectroscopy with the body composition monitor (BCM®; Fresenius Medical Care, Deutschland GmbH, Germany). The BCM takes measurements at 50 frequencies in a range of 5–1000 kHz. The measurement was performed approximately 30 min before the midweek HD session, with 4 conventional electrodes being placed on the patient, who was lying in supine position: 2 on the hand and 2 on the foot contralateral to the vascular access. Regarding the quality of measurements, all exceeded 95% which is the reference for an acceptable measurement quality.

The parameters obtained with the BCM were FTI, LTI, body cell mass, and OH/ECW. The FTI and LTI reference ranges given by the BCM are based on age and gender. Severe overhydration was considered if OH/ECW >15%.

2.5. Statistical methods

Patient characteristics were summarized using standard descriptive statistics. Kolmogorov–Smirnov test was used to test for normality of the variables distributions. Patients were categorized according to their group: intervention or control group. Categorical variables were presented as frequencies and percentages and continuous variables as median and interquartile range or as mean ± standard deviation, as appropriate. Baseline differences between intervention and control patients were evaluated using independent samples parametric and non-parametric tests (T Student Test or Mann–Whitney U Test) for continuous variables and chi-square tests for categorical variables. Kaplan–Meier survival analysis was done to analyze differences between the two groups. All statistical tests were performed using the Statistical

Please cite this article in press as: Caetano C, et al., Effect of an intradialytic protein-rich meal intake in nutritional and body composition parameters on hemodialysis patients, Clinical Nutrition ESPEN (2017), http://dx.doi.org/10.1016/j.clnesp.2017.04.003