# Residual Renal Function, Nutritional Status and Anemia in Patients on Peritoneal Dialysis

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## Introduction

Malnutrition and anemia are common in patients affected by chronic renal failure.

The mechanisms by which protein turnover is regulated in humans under different nutritional conditions are finely adapted and finalized to the preservation of lean body mass and specialized functions (1). Nevertheless, a sizable loss of lean body mass associated with functional impairment is observed in several conditions among which is renal failure (2). Weight loss, together with anorexia and muscle weakness, is commonly observed when chronic uremia is advanced as well as in hemodialysis or peritoneal dialysis patients (3). Inadequate nutritional intakes and/or superimposed illnesses are thought to play a major role in malnutrition. However, treatment(s) of uremia per se can impair protein metabolism (4).

During the last years an increasing number of patients affected by end-stage renal disease of different leading cause is being treated by renal-replacement therapy all over the world (5). The incidence of morbidity and mortality is high, in spite of the significant technological advances in the field of dialysis treatment (6).

Nutritional status is associated with outcome in dialysis patients, but many symptoms as well as high morbidity and mortality rates in patients with renal failure are also consequences of chronic severe anemia.

Anemia is a common feature of chronic renal failure, it is independent of the leading disease, and it is a consequence of decreased production of erythropoietini by the kidney, repeated blood losses, bone morrow suppression by uremic toxins, lack of nutritional factors (7). On the other side, an improvement of blood count has been noticed in many patients affected by end-stage renal failure after the beginning of renal replacement therapy (8).

In the light of most recent observations that survival on CAPD is associated with residual renal function and not with peritoneal clearances on continuous ambulatory peritoneal dialysis (9,10), we examined the relationship between RRF and common markers of nutrition and anemia in a group of patients on CAPD treatment during a 6-months follow up.

## Patients and Methods

We followed 32 patients (17 male, 15 female), middle-age 68 years (range 31 to 78), affected by end-stage renal failure of different leading cause during the first 6 months of CAPD treatment. All of the patients performed four 2-liters exchanges daily and were advised for a diet with 30 kcal/kg and 1 g protein/kg/day.

We assessed RRF, normalized protein catabolic rate (nPCR), total serum protein (TP), serum albumin (SA), serum transferin, cholesterol, skinfold thickness of the usual points (triceps skinfold thickness - TN, biceps skinfold thickness - BN, subscapular skinfold thickness - SSN, supra-iliacal skinfold thickness - SIN), mid-arm circumference (MAC), middle-arm muscle circumference (MAMC), body weight, body-mass index (BMI), percentage of body fat (F%) 7 days, 3 months and 6 months after the beginning of CAPD treatment.

The correlations between RRF and markers of blood count and nutrition were calculated by the Pearson's correlation test.

## Results

During the first 6 months of CAPD treatment, RRF slightly declined. On the other side Hb, cholesterol, serum transferin, skinfold thickness of the common points, MAC, MAMC, BMI, F%, nPCR, SGA and body weight improved significantly during the first 6-months of CAPD treatment Total serum protein and serum albumin onljy slightly improved during the first 6 months of CAPD treatment.

At the beginning of CAPD treatment we found significant positive correlations between RRF and TP, SIN and body weight. After 3 months of CAPD treatment, there were significant positive correlations between RRF and hemoglobin, SSN, SIN, body weight, nPCR and subjective global assessment score (SGA); and 6 months later there were significant positive correlations between RRF and hemoglobin, TP, body-weight, TN, SSN, SIN, F%, nPCR, SGA. The number of positive correlations increased during the follow-up, while we found no significant negative correlations between RRF and markers of nutrition and anemia in our patients.

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**Table 1. Correlations between RRF and markers of blood count and nutrition during the first 6 months of CAPD treatment**

| | RRF1 | RRF2 | RRF3 |
|---|---|---|---|
| Hb | .107 | .435* | .050 |
| TP | .433* | .041 | .378* |
| SA | .171 | .129 | .067 |
| Cholesterol | -.078 | -.061 | .69 |
| TN | .403 | .210 | .420* |
| BN | .034 | .299 | .339 |
| SSN | .232 | .501* | .620* |
| SIN | .370* | .532** | .531* |
| MAC | .244 | .260 | .360* |
| MAMC | .271 | .189 | .252 |
| Body weight | .4278 | .382* | .377* |
| F% | -.137 | .090 | .248 |
| BMI | -.087 | .319 | .048 |
| nPCR | .279 | .369* | .363* |
| SGA | .345 | .454** | .313 |
| Serum transferin | .347 | | .192 |

RRF1 (l/m2/week): residual renal function at the beginning of CAPD treatment; RRF2: RRF after 3 months of CAPD treatment; RRF3: RRF after 6 months of CAPD treatment; nPCR (g/kg/day): normalized protein catabolic rate; TP (g/l) : total serum protein; SA (g/l): serum albumin ; serum transferin (g/dl); cholesterol (mmol/l); TN (mm): triceps skinfold thickness ; BN: biceps skinfold thickness ; SSN: subscapular skinfold thickness ; SIN: supra-iliacal skinfold thickness ; MAC: mid-arm circumference ; MAMC: middle-arm muscle circumference ; body weight (kg); BMI: body-mass index; F%: percentage of body fat

**Conclusion**

Nutritional status and blood count improved in our patients during the first 6 months of CAPD treatment, thanking to avoiding dietary restrictions and solving uremic symptoms and thanking to increased intake of nutrients. Residual renal function positively influenced blood count and nutritional status in our patients, as it is proved by the increasing numbers of positive correlations between RRF and nutritional markers during the follow-up. After 6 months of CAPD treatment there were no negative correlations between RRF and the observed nutritional markers. We can emphasize the role of RRF in improvement of blood count and nutritional status in our patients.

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