

## **USE OF AMINO ACID CONTAINING SOLUTIONS IN CONTINUOUS AMBULATORY PERITONEAL DIALYSIS PATIENTS AFTER PERITONITIS: RESULTS OF A PROSPECTIVE CONTROLLED TRIAL**

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### **Summary**

To counteract the catabolic effects of peritonitis continuous ambulatory peritoneal dialysis patients with peritonitis were dialysed with amino acid solutions alternating with regular glucose solutions and were compared with controls who continued to use exclusively glucose solutions. Our results indicate that uncomplicated peritonitis produces a transient negative nitrogen balance generally lasting for one week only. Therefore nutritional supplementation seems to be unnecessary. In contrast, the administration of amino acid solutions, in the way we gave them, may suppress the appetite of some patients.

### **Introduction**

Protein losses during continuous ambulatory peritoneal dialysis, especially if combined with a low protein intake, may lead to malnutrition at least in some continuous ambulatory peritoneal dialysis patients [1]. Recurrent peritonitis accompanied with increased protein losses may further impair the nutritional status of these patients [2].

Peritoneal dialysis solutions containing amino acids improved body nitrogen stores in stable continuous ambulatory peritoneal dialysis patients after four weeks [3]. This paper describes the results of a prospective controlled study which investigated the effects of amino acid in comparison to regular glucose (Dianeal) solutions in continuous ambulatory peritoneal dialysis patients with peritonitis over four weeks.

### **Patients and methods**

Twenty-two continuous ambulatory peritoneal dialysis patients with peritonitis entered the study. Ten patients continued to dialyse with regular glucose (Dianeal) solutions while 12 patients performed two 2-litre exchanges with a

one per cent amino acid solution during the day, alternating with glucose solutions. The amino acid solutions were derived by appropriate dilution of the intravenous amino acid solution TRAVASOL and provided a daily amino acid supplement of 30g [3]. Only 12 patients completed the four week study. Four of those receiving amino acid solutions, but none of the controls, withdrew from the study complaining of poor appetite. Other reasons for drop out were transplantation (3), transfer to IPD (2), and death (1). In these 12 patients we studied 1) the protein and energy intake by dietary history, 2) the 24-hour dialysate effluent for protein, urea, white cell count, and organisms, 3) the blood biochemistry (albumin, total protein, transferrin, haemoglobin, urea, creatinine, cholesterol, and triglycerides), 4) the body weight.

These measurements were repeated weekly. Dietary intake was compared to the intake one week before peritonitis while biochemical values and body weight were compared with the corresponding values at the last clinic appointment (4–51 days before peritonitis). Initially and at the end of the four week period fasting plasma amino acid concentrations (except for tryptophan) were measured and compared with fasting plasma values of five healthy adults. The protein (or nitrogen) balance was calculated by the difference between the daily dietary protein intake (including 30g of amino acids in those dialysed with amino acid solutions) and the daily protein losses composed of dialysate protein, dialysate amino acids (2g) [4], dialysate urea-N  $\times$  6.25, urine urea-N  $\times$  6.25, urine protein, and 1.5g of nitrogen  $\times$  6.25 from stool and skin [5].

Statistical analysis was carried out using analysis of variance, Student's paired and unpaired 't' test, linear regression analysis, and chi-square test where appropriate.

## Results

During peritonitis mean protein losses into the dialysate were 12.7g per day in the control and 10.8g per day in the amino acid group. The white cell count was increased above  $100 \times 10^6$  L in both groups, and the effluent cultures were positive in 11 of 12 patients. Within one week after the onset of peritonitis the effluent cultures became negative in 11 of 12 patients, the white cell count returned to normal, and the protein losses decreased to values between eight to nine g per day.

Dietary protein intake decreased during peritonitis from 0.8 to 0.5g/kg/day ( $p < 0.05$ ). Thereafter it rebounded in most controls but only in one patient receiving amino acid solutions (Figure 1). Although the difference in the mean dietary protein intake was not statistically significant, it is noteworthy that nine of the initial 12 patients receiving amino acid solutions but only three of the initial ten controls complained of a poor appetite during the study ( $p < 0.05$ ). Mean dietary energy intake decreased from 17 to 13kcal/kg/day ( $p = \text{NS}$ ) during peritonitis and varied in parallel with the dietary protein intake thereafter in both groups.

The mean nitrogen balance was negative ( $-4.5\text{g N/day}$ ) during peritonitis but equilibrated one week later. Despite amino acid supplementation the nitrogen balances of patients in the amino acid group were similar to those of the controls.

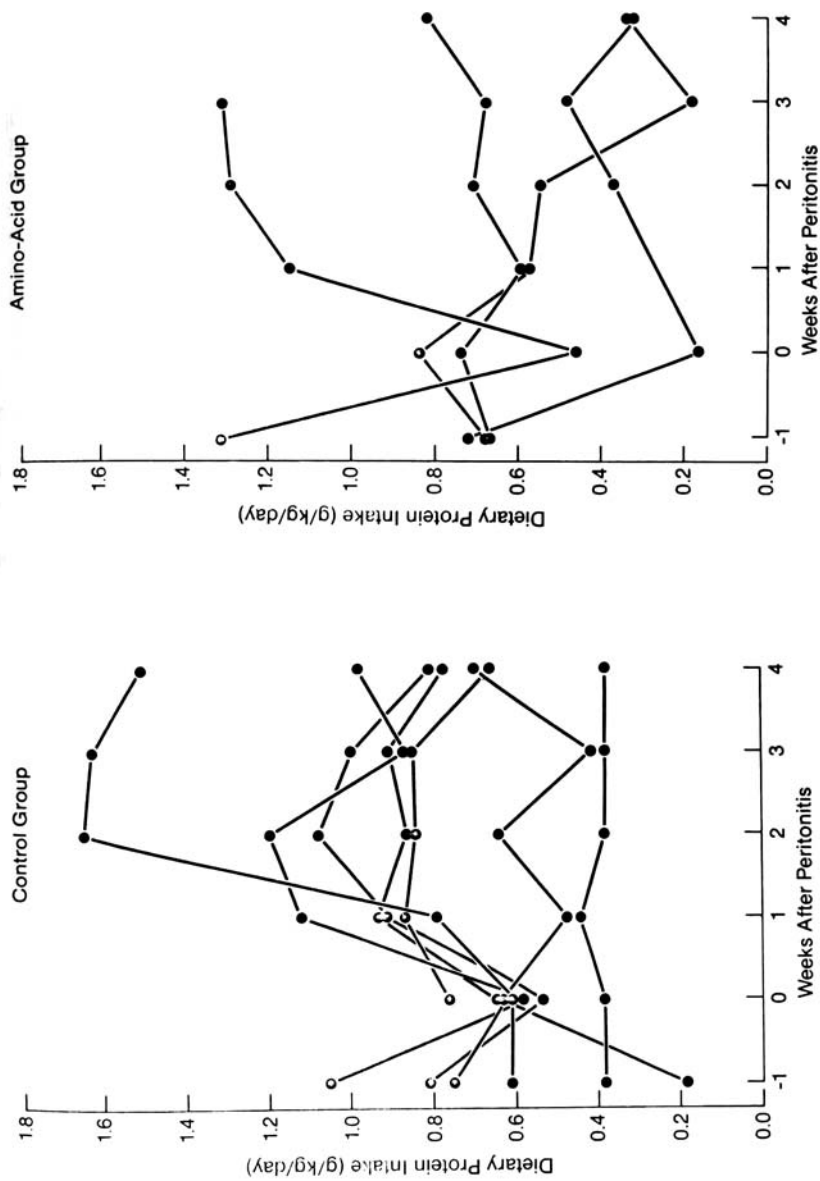


Figure 1. Changes in the individual dietary protein intake of seven controls and four of five patients receiving amino acid solutions

Body weight did not change during peritonitis or during the four week follow-up in either group. Serum albumin, total protein and transferrin decreased significantly during peritonitis, whereas the other blood values remained unchanged. However, there was a significant positive correlation ( $r=0.01$ ;  $p<0.01$ ) between the decreases in serum albumin and in haemoglobin following peritonitis. During the study serum albumin improved to the pre-peritonitis level in the control but not in the amino acid group. Blood urea of those receiving amino acids increased from 20mM/L to 30mM/L ( $p<0.01$ ) (Figure 2). The other blood biochemistry did not differ significantly between the two groups. Compared with the values in the controls fasting plasma amino acid levels did not change significantly in response to the administration of amino acid solutions.

In both groups histidine and methionine levels were significantly ( $p<0.01$ ) reduced by 40 per cent and 50 per cent, respectively, at baseline when compared to normal values. The levels of tyrosine were decreased by 50 per cent ( $p<0.01$ ) while aspartic acid and asparagine concentrations were elevated in the average by 50 per cent ( $p<0.05$ ) and 150 per cent, respectively.

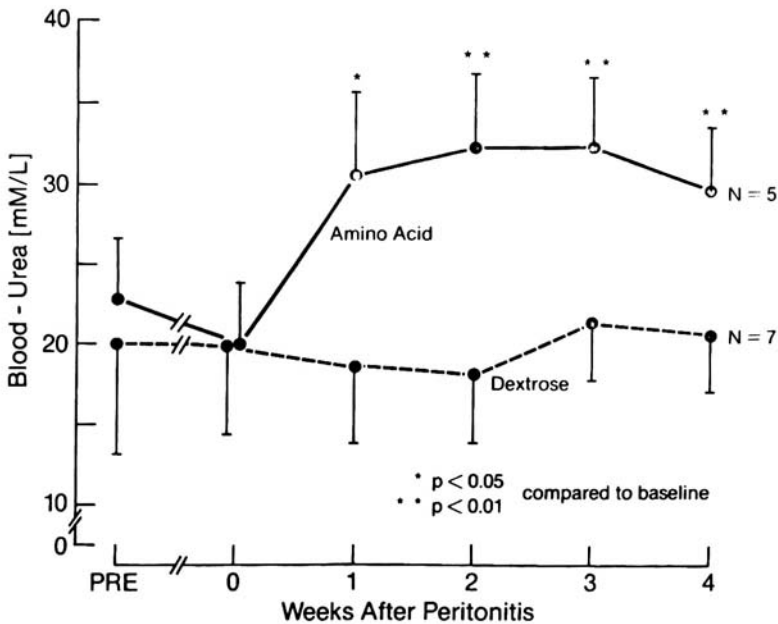


Figure 2. Changes in blood urea during peritonitis and for four weeks thereafter

## Discussion

Our results confirm the findings of Rubin et al [6] that prompt therapy of peritonitis during continuous ambulatory peritoneal dialysis clears clinical signs and symptoms within 24 to 48 hours and restores the deranged peritoneal

transport to baseline in most patients. The strong correlation between the changes in serum albumin and in haemoglobin suggests that dilution may be at least partially responsible for the drop in serum albumin during peritonitis. The catabolic effects of illness are usually compensated by a rebound increase in dietary intake [7] which we observed in the controls but not in patients receiving amino acid solutions. Poor appetite was the major adverse effect of the amino acid solutions. It probably counteracted the expected benefits of the amino acid supplementation.

Patients receiving amino acid solutions seemed to preserve their metabolic homeostasis by reducing total dietary intake when challenged with this extra amino acid load. Although blood urea seldom increased above 30mM/L during administration of the amino acids, continuous ambulatory peritoneal dialysis may not be efficient enough to handle the additional nitrogen load, at least in some patients. Lowrie et al [8] observed that haemodialysis patients respond to a reduced removal of metabolites (i.e. inadequate dialysis) by decreasing their dietary intake. Even though fasting plasma amino acid concentrations remained unchanged after four weeks in patients receiving amino acid solutions, previous experience has shown that the intraperitoneal administration of amino acids leads to a transient increase in the corresponding plasma amino acid concentrations [3]. Absolute or relative alterations in plasma amino acids like tryptophan or tyrosine change neurotransmitter synthesis of serotonin and catecholamines, respectively, and thus may depress appetite and food intake by influencing the appetite control centre [9,10].

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