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NEPHROLOGY - LETTER TO THE EDITOR

Beneficial effects of combination therapy of intradialytic parenteral nutrition and oral L-carnitine administration

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Editor,

According to the review article on nutritional support in hemodialysis patients by Bossola et al. [1], intradialytic parenteral nutrition (IDPN) seems to improve nutritional parameters such as serum albumin and body weight, but the effects of IDPN on long-term survival remain controversial. IDPN can provide energy of 7–8 kcal/kg/day and protein of 0.3–0.4 g/kg/day at best, and in order to attain the recommended nutritional requirements, spontaneous oral intake must reach >0.8 g/kg/day for protein and >20 kcal/kg/day for energy [2]. Therefore, the effects of IDPN on nutritional status often seem uncertain. In some patients, the loss of muscle mass occurs despite IDPN.

We report here our experience of the use of L-carnitine in combination with IDPN in patients on chronic hemodialysis. Our IDPN therapy consisted of 200 ml of 6.1 % amino acids solution, 200 ml of 50 % dextrose solution, and 100 ml of 20 % soy lipid solution. Total energy intake including IDPN ranged from 30 to 35 kcal/kg/day. These were infused through the blood line throughout each entire dialysis session. In 6 patients whose nutritional conditions, such as body weight and muscle mass, had not improved by IDPN for 6 months, oral L-carnitine of 300 mg was additionally administered 20 min before each dialysis session. Body composition by bioimpedance method, serum levels of high-sensitivity C-reactive protein (hs-CRP) and albumin were evaluated every 3 months for 1 year.

The effects of L-carnitine added to IDPN were shown in Table 1. During the 6 months on IDPN therapy alone, the fat mass significantly increased, while the muscle mass significantly decreased. With additive L-carnitine administration, however, the muscle mass significantly increased at month 3. Serum albumin levels increased in 2 patients, decreased in 3, and did not change in one. The reason of such inconsistent changes of serum albumin remains unknown. Six months after L-carnitine administration, we found a significant decrease in serum hs-CRP level, which persisted 1 year after L-carnitine administration. However, its clinical impacts may be modest, because serum hs-CRP level before L-carnitine administration was low at 0.051 mg/dL.

Many studies have indicated that hemodialysis is a protein-catabolic procedure, and hemodialysis itself may be a cause of malnutrition leading to a loss of lean

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Table 1 Changes in nutritional parameters during intradialytic parenteral nutrition and L-carnitine therapy

	IDPN alone	Baseline (after IDPN)	IDPN + L-carnitine		
	Month −6		Month 3	Month 6	Month 12
Total body fat (kg)	10.1 ± 0.8**	11.0 ± 1.6	10.7 ± 1.7	10.6 ± 1.9	10.8 ± 1.6
Muscle mass (kg)	40.5 ± 7.4*	38.5 ± 6.5	39.1 ± 6.9*	39.2 ± 7.1	38.7 ± 6.8
Albumin (g/dL)	3.80 ± 0.40	3.81 ± 0.42	3.78 ± 0.33	3.78 ± 0.30	3.75 ± 0.32
hs-CRP (mg/dL)	0.058 ± 0.033	0.051 ± 0.033	0.045 ± 0.040	0.038 ± 0.020*	0.040 ± 0.023*

Data are shown as mean ± SD

hs-CRP high sensitivity C-reactive protein, *IDPN* intradialytic parenteral nutrition

* $p < 0.05$, ** $p < 0.01$ compared with baseline (paired t test)

body mass and an increase of the fat mass [3]. Ikizler et al. [4] measured the hourly respiratory quotient (RQ) during the hemodialysis session. RQ gradually decreased throughout the session and this decrease in RQ continued even after the session. The RQ significantly decreased from 0.9 of predialytic mean value to 0.82 of postdialytic (2 h after the session) mean value ($p < 0.001$). RQ indicates which fuel is being metabolized to supply the body with energy: the RQ of fat is 0.71 and that of glucose is 1.00. Critically ill patients show a preference for prompt energy availability to avoid protein catabolism, with metabolic shifts from a more glucose-based to a more lipid-based oxidation [5]. However, carnitine deficiency, which is frequently observed in hemodialysis patients, reduces the efficiency of mitochondrial energy production from lipids [6, 7]. Therefore, we consider the possibility that disordered lipid metabolism induced by L-carnitine deficiency would bend the metabolic shift from a more glucose-based to a more protein-based oxidation. L-carnitine supplementation may repair lipid metabolism and prevent the loss of muscle mass. As L-carnitine is rapidly removed during the hemodialysis session, the patients may be exposed to a protein-catabolic status, especially at the final phase of the session. To avoid this protein–energy wasting (PEW), we administered L-carnitine not after but before the hemodialysis session. Further studies are required to compare the effects of L-carnitine supplementation between the predialytic and postdialytic administration.

PEW and inflammation are closely associated in patients on maintenance dialysis [8]. Recent studies have suggested that L-carnitine plays favorable roles on inflammation of hemodialysis patients [9, 10]. Regular L-carnitine supplementation in hemodialysis patients can improve cellular defense against chronic inflammation and oxidative stress, most likely by modulating the specific signal transduction of pro-inflammatory cytokines and oxidative stress [9]. We found a decrease in serum hs-CRP levels after L-carnitine administration, but other markers, such as interleukin-6, interleukin-1β, or adipokines, were not determined.

Based on our results, additive L-carnitine administration may improve not only the effect of IDPN but also PEW in hemodialysis patients. Randomized clinical trials including a larger number of patients are required to confirm this effect. In addition, a higher dose of L-carnitine may lead to more pronounced effects.

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