Levocarnitine Improves Cardiac Function in Hemodialysis Patients With Left Ventricular Hypertrophy: A Randomized Controlled Trial

Terumi Higuchi, MD, PhD, Masanori Abe, MD, PhD, Toshio Yamazaki, MD, Erina Okawa, MD, Hideyuki Ando, MD, Sunao Hotta, PhD, Osamu Oikawa, MD, PhD, Fumito Kikuchi, MD, PhD, Kazuyoshi Okada, MD, PhD, and Masayoshi Soma, MD, PhD

Background: Levocarnitine deficiency in hemodialysis patients is common. Although the effect of levocarnitine therapy on uremic anemia has been studied in small trials, its effects on cardiac function remain unclear.

Study Design: Multicenter, prospective, open-label, parallel, randomized, controlled trial.

Setting & Participants: Patients undergoing maintenance hemodialysis with carnitine deficiency (free carnitine plasma concentration < 40 μmol/L) enrolled in 3 hemodialysis centers.

Intervention: Random assignment to treatment for 12 months with oral levocarnitine therapy at a dose of 20 mg/kg/d or control group (no levocarnitine therapy).

Outcomes & Measurements: Cardiac function was assessed by echocardiography. The primary end point was change in ejection fraction from baseline at the end of the study. Secondary end points included changes in left ventricular mass index and clinical parameters from baseline at the end of the study.

Results: 222 patients were randomly assigned, of whom 148 patients (levocarnitine group, n = 75; control group, n = 73) were analyzed. Ejection fraction increased from baseline to the end of the study in the levocarnitine group by 5.43% (95% CI, 4.53%-6.32%), but not in the control group (change, −0.14%; between-group difference, 5.57% [95% CI, 4.48%-6.66%]; P < 0.001). Left ventricular mass index decreased from baseline to the end of the study in the levocarnitine group (change of −8.89 [95% CI, −11.7 to −6.09] g/m²), but not in the control group (change of 1.62 g/m²; between-group difference, 10.50 [95% CI, 7.51 to 13.60] g/m²; P < 0.001). Levocarnitine therapy reduced N-terminal pro-brain natriuretic peptide (NT-proBNP) levels and improved the erythropoietin responsiveness index, whereas no such effects were observed in the control group.

Limitations: Not a double-blinded study.

Conclusions: Levocarnitine therapy is useful for hemodialysis patients with carnitine deficiency; these patients may benefit from such therapy, with amelioration of cardiac function and reduction of left ventricular mass index.


INDEX WORDS: Carnitine; cardiac function; cardiac morphology; ejection fraction (EF); levocarnitine; hemodialysis (HD); left ventricular hypertrophy (LVH); left ventricular mass index (LVMI); N-terminal pro-brain natriuretic peptide (NT-proBNP); end-stage renal disease (ESRD); randomized controlled trial (RCT).