PART TWO

Host Defenses and Infection

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Favorable Changes in Lipid Metabolism and Cardiovascular Parameters After Icodextrin Use in Peritoneal Dialysis Patients

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Better control of cardiovascular function in patients on peritoneal dialysis (PD) is critical because PD patients have a tendency to overhydration, which has been proved to be associated with cardiovascular and patient outcome. In the general population, lipid metabolism is also considered to be an important indicator of future cardiovascular events. Icodextrin has been used to improve ultrafiltration volume without increasing dextrose load. We therefore expected that parameters of lipid metabolism and cardiovascular function could both be improved, or at least maintained, after icodextrin use in PD patients. We therefore analyzed those parameters in 14 prevalent PD patients who required a switch from dextrose to icodextrin solution for the long dwell at 1 year before the switch, at the time of the switch, and at 1 and 2 years after the switch.

In the study patients, cardiovascular remodeling evaluated by ultrasonographic left ventricular mass index was diminished, but the intima media area of the cervical artery was elevated after icodextrin use. Intima media thickness did not change over time. Biochemical indices such as brain natriuretic peptide, atrial natriuretic peptide, lipoprotein A, total cholesterol, and triglycerides were all lower after icodextrin use. These results indicate that icodextrin has the potential to improve lipid metabolism, volemic status, and cardiac hypertrophy in prevalent PD patients. However, atherosclerotic vascular change is refractory to improvement.

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Key words
Lipid metabolism, cardiovascular remodeling, volemic status, ultrasonography

Introduction

Cardiovascular complications are the major cause of morbidity and mortality in end-stage renal disease (ESRD) patients (1), and several risk factors—primarily lipid metabolism, volemic status, and cardiac remodeling evaluated by ultrasonography (2,3)—independently predict cardiovascular outcome (4). Therefore, maintaining appropriate values for those factors is of importance in managing ESRD patients.

Icodextrin was developed to improve dialytic ultrafiltration (UF) without an increase in dextrose load. Ultrafiltration is closely related to water balance in dialysis patients, and consequently, we expected that PD patients who switched from dextrose to icodextrin solution might show better clinical outcomes in terms of lipid metabolism, volume control, and cardiovascular indices. To elucidate these potential effects of icodextrin, we retrospectively analyzed the foregoing parameters for 1 year before until 2 years after the start of icodextrin use in prevalent PD patients with insufficient ultrafiltration (UF) volume.

Patients and methods

The study enrolled 10 patients with chronic glomerular nephritis and 4 with diabetic nephropathy on PD whose long-dwell PD solution was switched from 2.5% dextrose to icodextrin solution because of insufficient UF and consequent heart failure. The mean age of these patients was 54.9 years, and their mean duration on dialysis was 4.3 years. Cardiovascular functions, such as left ventricular mass index (LVMI),

intima media thickness (IMT), and intima media area (IMA) of the cervical artery (5), were evaluated by ultrasonography 1 year before the switch to icodextrin, at the switch, and at 1 and 2 years after the switch. Biochemical and volemic parameters such as brain natriuretic peptide (BNP), atrial natriuretic peptide (ANP), lipoprotein A [Lp(a)], total cholesterol (TC), high-density lipoprotein cholesterol (HDL), and triglycerides (TG) were measured every 6 months from 1 year before to 2 years after the switch.

The paired *t*-test was used for statistical analyses, and $p < 0.05$ was considered to be statistically significant.

Results

Compared with 1 year before the switch, TG and LVMI values at the time of the switch (time 0) were significantly elevated; the other parameters were not significantly increased (Figures 1 and 2). As compared with time 0, values for BNP, ANP, TC, TG, Lp(a), and LVMI at 2 years after the start of icodextrin were significantly lower (Figures 1 – 3). No significant change in IMT was observed at any time during the study period (Figure 2). At 2 years after time 0, IMA was significantly increased (Figure 2).

Discussion

Our data clearly show that the use of icodextrin solution, as compared with dextrose solution alone, improves lipid metabolism, volemic status (as judged by the level of natriuretic peptides), and cardiac hypertrophy in PD patients. These outcomes could be at least partly attributed to better management of fluid balance and a lower glucose load with icodextrin, as previously reported (6,7). Because natriuretic peptides and cardiac hypertrophy have been proved to be significant risk factors for mortality in ESRD patients (4,8,9), our findings may reinforce a recent report of better survival in Japanese PD patients using icodextrin solution than in patients not using it (10).

Interestingly, atherosclerotic vascular change as evaluated by measurements of IMT and IMA was more refractory to icodextrin treatment than was cardiac hypertrophy. Similar findings were reported in hypertensive patients treated with antihypertensive drugs (11). We assume that functional cardiac hypertrophy can be ameliorated by appropriate interventions, but that atherosclerotic vascular lesions in dialysis patients often involve calcified deposits in the intima media, which would be unlikely to be changed by treatment after formation of the calcification.

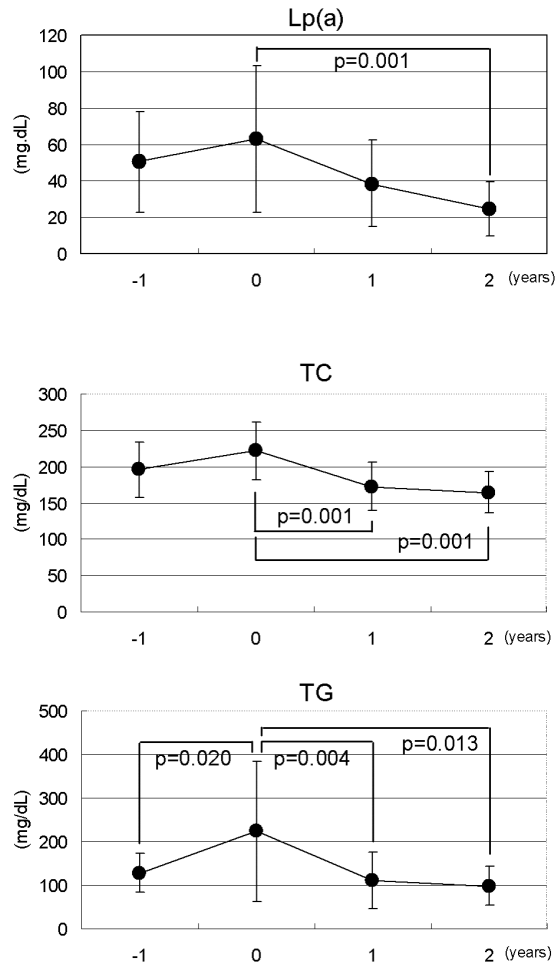

FIGURE 1 Change in lipid metabolism before and after icodextrin use. Lp(a) = lipoprotein a; TC = total cholesterol; TG = triglycerides.

The present study has some limitations. First, our findings are the result of retrospective observation. Second, we enrolled only patients for whom relevant data were available, possibly causing selection bias. Finally, patients were counseled to switch to icodextrin because of insufficient UF with 2.5% dextrose solution; the findings may therefore not be applicable to patients having a different status.

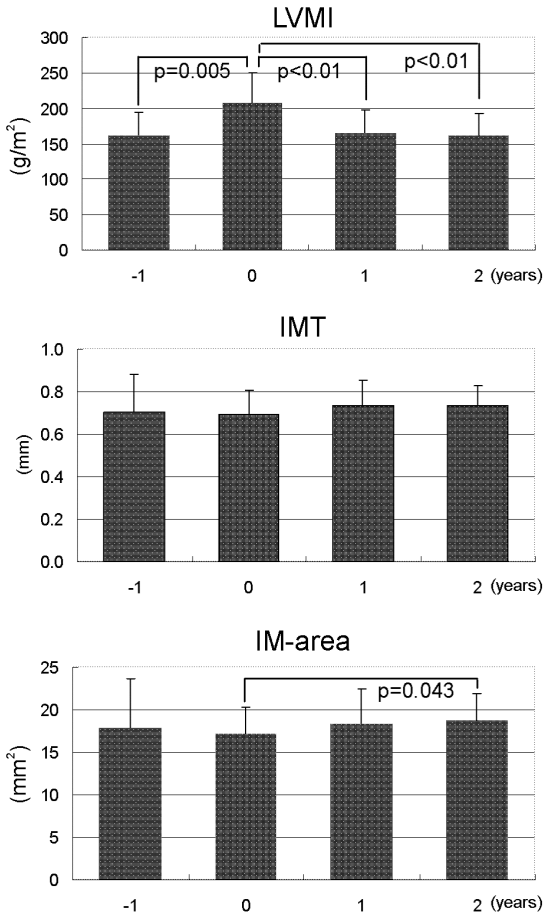

FIGURE 2 Change in cardiac hypertrophy before and after icodextrin use. LVMI = left ventricular mass index; IMT = intima media thickness; IM-area = intima media area.

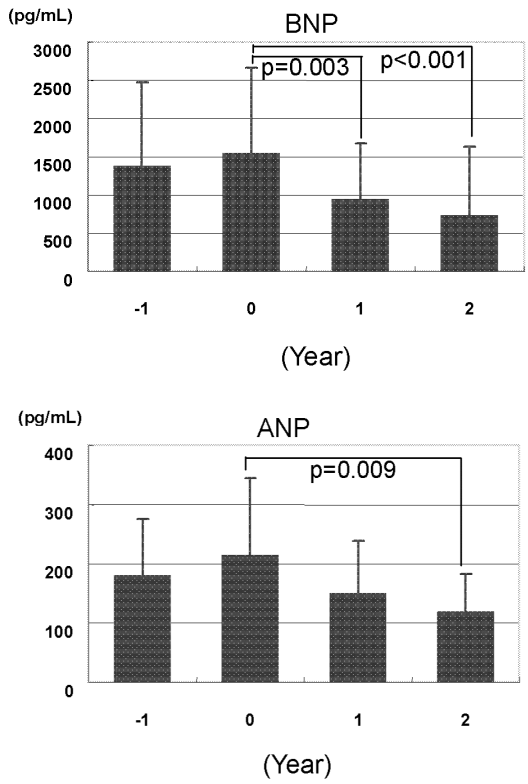

FIGURE 3 Change in the values of brain natriuretic peptide (BNP) and atrial natriuretic peptide (ANP) before and after icodextrin use.

Conclusion

Patients on PD treated with icodextrin solution for their long dwell experienced improved parameters of lipid metabolism, volemic status, and cardiac hypertrophy.

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