

Longitudinal Changes in Parameters of Cardiovascular Function in Patients Treated for 8 Years with Hemodialysis or Peritoneal Dialysis

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Cardiovascular complications are obviously important in the management of dialysis patients, and ultrasonography can be used to evaluate cardiac indices that can predict these complications. However, long-term longitudinal changes in ultrasonographic cardiovascular indices in dialysis patients are not well known. Also, the implications of lipid metabolism for cardiovascular change in dialysis patients is controversial. We therefore analyzed ultrasonographic cardiac parameters and laboratory data for lipid metabolism in patients who had been on peritoneal dialysis (PD) or hemodialysis (HD) for 8 years and also in patients who had been on PD for 4 years followed by another 4 years on HD.

We found that lipid metabolism was worse but that cardiovascular indices were more stable over time in PD patients than in HD patients. Mean blood pressure was also better maintained in PD patients. These results indicate that cardiovascular function can be maintained in PD patients over the long term, given that blood pressure is controlled even though dyslipidemia worsens.

Key words

Hemodialysis, cardiovascular remodeling, longitudinal study, dyslipidemia

Introduction

Cardiovascular complications are the predominant cause of morbidity and mortality in end-stage renal

disease patients (1). Ultrasonographic cardiovascular indices are useful for predicting such complications (2), but longitudinal studies aiming to clarify long-term changes in those indices in dialysis patients are sparse. We therefore retrospectively compared various parameters of cardiovascular function in patients treated with peritoneal dialysis (PD) or hemodialysis (HD) for 8 years and also in patients treated with PD for 4 years and then with HD for another 4 years from the commencement of dialysis.

Patients and methods

For this retrospective analysis, we enrolled 35 patients on dialysis treatment. The underlying primary renal disease was chronic glomerular nephritis in all cases. Group A consisted of 10 patients who had been treated with PD for 8 years; group B, of 15 patients who had been treated with HD for 8 years; and group C, of 10 patients who had been treated with PD for 4 years, and then with HD for another 4 years. Using B-mode ultrasonography, left ventricular mass index (LVMI), left ventricular end-diastolic diameter (LVDD), intima media thickness of the cervical artery (IMT), and intima media area (IMA) were measured once annually (3). Other clinical parameters such as mean blood pressure (BP), body mass index (BMI), total cholesterol (TC), high-density lipoprotein (HDL) cholesterol, and triglycerides (TG) were also measured at least once annually.

Results

We observed no differences between the three groups at the start of dialysis therapy in terms of age, BMI, mean BP, LVMI, LVDD, IMT, IMA,

TC, HDL cholesterol, TG, or cardiothoracic ratio. After 8 years on dialysis, group A patients showed significantly higher BMI, TC, and TG values than did group B patients (Figures 1 and 2). By contrast, LVMI and IMT were significantly lower in group A than in group C after 8 years on dialysis therapy, and they showed a trend toward being lower in group A than in group B, although that trend did not reach statistical significance (Figures 3 and 4). In group A, mean BP was also lower than that seen in groups B and C (Figure 1). Neither HDL cholesterol nor LVDD showed a statistically significant difference between the groups over time (Figures 2 and 3).

Discussion

The present report is the first to document longitudinal changes of biochemical and ultrasonographic cardiovascular indices in patients on dialysis for 8 years. Our results clearly show that patients on PD tend toward hyperlipidemia and greater BMI over time. Nevertheless, their ultrasonographic cardiovascular indices are much better maintained than are those for patients on HD for 8 years. Possible explanations for this paradox are that hyperlipidemia and obesity are classical cardiac risk factors in the general population but not in dialysis patients (4), or that only PD patients with good nutrition status can stay on PD for such a long period (selection bias).

Past reports on ultrasonographic cardiac indices in PD and HD patients have been controversial (5–7). The more stable cardiovascular parameters in the PD patients in our study may result, at least in part, from better BP control than that seen in the HD patients. Blood pressure control has also been reported as an important factor determining cardiac hypertrophy in dialysis patients (8).

Interestingly, patients who switched dialysis modality from PD to HD at year 4 showed even worse values for mean BP, LVMI, and IMT at year 8 than did patients who were on HD alone for 8 years—although the values for those parameters at year 4 in group C were equivalent or even better than those seen in group B at the 4-year mark. We speculate that patients who required a modality change may have had unknown risk factors that influenced outcome after the switch.

Conclusions

Patients on PD are more prone to hyperlipidemia and BMI increase than are patients on HD, but over the long term, cardiovascular function is better maintained in PD patients than in those on HD.

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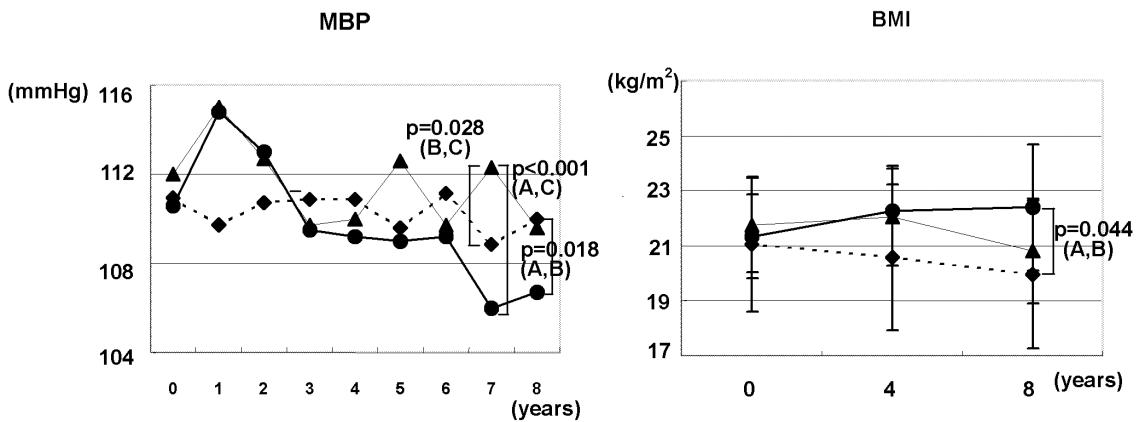


FIGURE 1 Longitudinal changes in mean blood pressure (MBP) and body mass index (BMI) during 8 years on peritoneal dialysis (group A, filled circles), hemodialysis (group B, filled diamonds), and peritoneal dialysis followed by hemodialysis (group C, filled triangles).

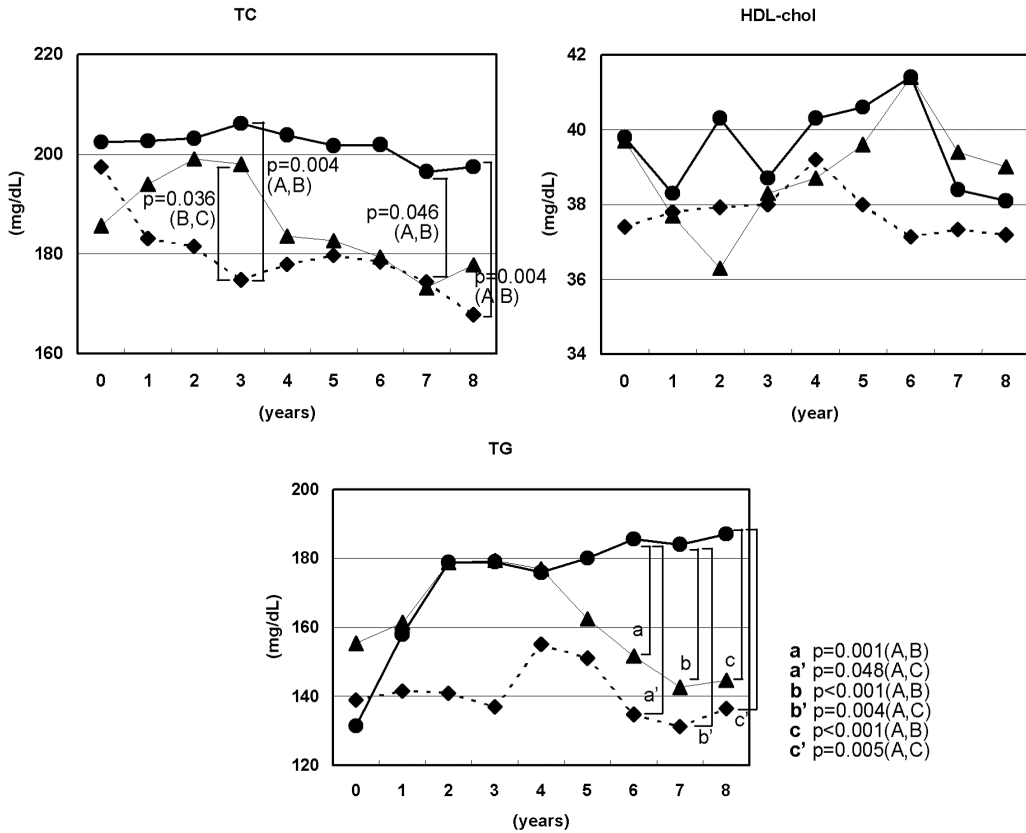


FIGURE 2 Longitudinal changes in lipid profile during 8 years on peritoneal dialysis (group A, filled circles), hemodialysis (group B, filled diamonds), and peritoneal dialysis followed by hemodialysis (group C, filled triangles). TC = total cholesterol; HDL-cholesterol = high-density lipoprotein cholesterol; TG = triglycerides.

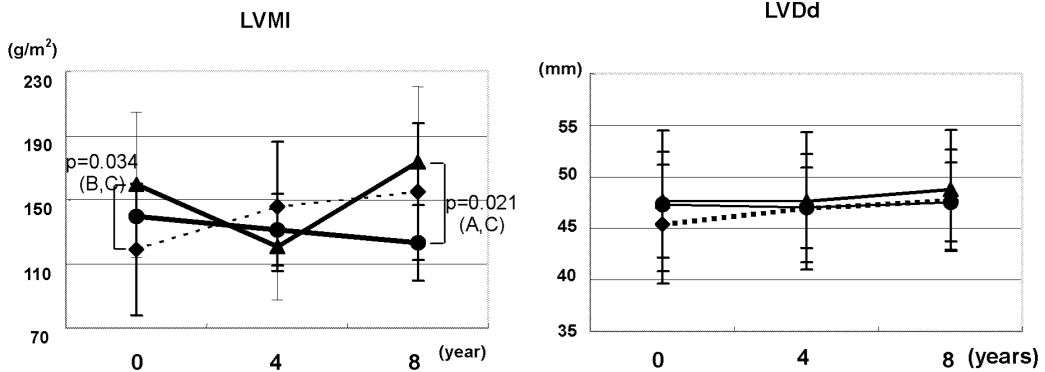


FIGURE 3 Longitudinal changes in cardiac hypertrophy during 8 years on peritoneal dialysis (group A, filled circles), hemodialysis (group B, filled diamonds), and peritoneal dialysis followed by hemodialysis (group C, filled triangles). LVMI = left ventricular mass index; LVDD = left ventricular end-diastolic diameter.

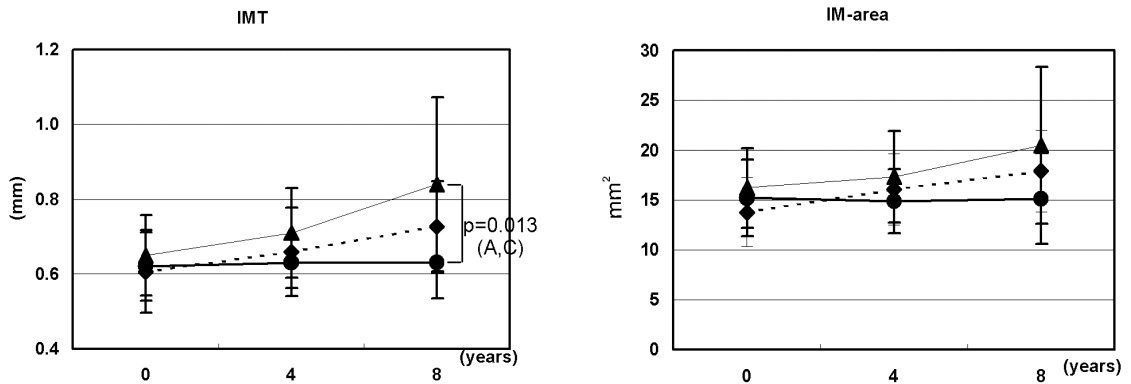


FIGURE 4 Longitudinal changes in atherosclerosis during 8 years on peritoneal dialysis (group A, filled circles), hemodialysis (group B, filled diamonds), and peritoneal dialysis followed by hemodialysis (group C, filled triangles). IMT = intima media thickness; IM-area = intima media area.

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