



We can have it all, but we just cannot have it all at once

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Although dialysis therapy in Japan has a 60-year history and we have achieved some of the best results in the world, blood pressure management in dialysis patients has remained an endless theme for specialists in the fields of hypertension and dialysis. Blood pressure is one of the most crucial factors affecting the occurrence of cardiovascular events, and many clinicians have encountered this well-known problem in dialysis patients. So how can we control blood pressure to improve the prognosis of dialysis patients? Despite the fact that blood pressure of nondialysis patients is an evidence-rich area, regarding dialysis patients, it has not even been determined as to what point in time blood pressure should be used as an indicator of cardiovascular events [1]. Although there is no significant difference between healthy subjects and dialysis patients regarding the cause of hypertension, the disruption of renal function results in a certain degree of the loss of blood pressure control. The acquired causes of the loss of blood pressure control include (1) body fluid excess, (2) abnormalities of the renin–angiotensin system, (3) enhancement of sympathetic activity, (4) disorders of endothelial-dependent vasodilation, and (5) side effects of erythropoietin treatment. Particularly in anuric patients, fluid excess substantially affects blood pressure, and hence, the maximum value before dialysis at the beginning of the week is robustly increased. Blood pressure is reduced when water removal by dialysis is performed, but when the water removal rate is high, it may lead to shock-level hypotension caused by intravascular collapse. Therefore, blood pressure control of dialysis patients has been considered difficult, fluctuating between fluid excess and fluid insufficiency.

In the study published in this issue of *Hypertension Research*, Tsuruya et al. demonstrated that postdialysis

systolic blood pressure and pulse pressure are more accurate predictors of all-cause and cardiovascular mortality than predialysis systolic blood pressure and showed U-shaped associations with these outcomes in 2690 Japanese hemodialysis patients [2]. In their study, both predialysis and postdialysis systolic and diastolic blood pressure, as well as pulse pressure, showed U-shaped hazard ratios for all-cause and cardiovascular mortality. The lowest risk for cardiovascular mortality was found in those with predialysis and postdialysis blood pressures of 120–139 mmHg. This value is much lower than those in previous studies, which reported blood pressures of 140–159 mmHg [3]. As the lowest risk of this U-curve in studies from overseas is also at a high blood pressure of 160 mmHg [4], evidence-based decisions will be substantially different from the management goals for nondialysis persons [1]. Even regarding the data from the same Japanese dialysis patients, the results of the primary endpoint may change with the use of different analytical methods and different sample extraction techniques. Of course, the optimal target must be changed to analyze various data in various ways. The novelty of the study by Tsuruya et al. is that it gives significance to postdialysis blood pressure, which has not previously received much attention from researchers and clinicians. The Japanese Society of Dialysis Therapy proposed in their 2010 guidelines to set the predialysis systolic blood pressure at the beginning of the week to <140/90 mmHg [5]. However, the rate of compliance to these guidelines has not been very high because this value did not match those used for management in the clinical field. The reason may be that many patients experience hypotension during the dialysis session. If the predialysis systolic blood pressure is set below 140 mmHg in accordance with these guidelines, many clinicians may worry about the possibility of hypotension occurring during dialysis in some patients, which has been considered a risk factor for patient prognosis, similarly to hypoglycemia [6].

Tsuruya et al. also demonstrated that a postdialysis systolic blood pressure of 120–139 mmHg demonstrated the lowest risk of cardiovascular events. On the basis of these

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results, when the postdialysis systolic blood pressure is set to 120–139 mmHg, it may be possible to avoid hypotension. In addition, considering that the most favorable predialysis systolic blood pressure is also 120–139 mmHg, patients who are not anuric, patients who have similar predialysis and postdialysis blood pressures, patients who have sufficient cardiac function, and patients with only a small amount of fluid removal at a dialysis session may have a good prognosis. On the other hand, a postdialysis systolic blood pressure of 120–139 mmHg might require some patients to have systolic blood pressures of dangerous levels (≥ 180 mmHg) at the start. Although it is possible to derive various hypotheses from the results of one study, it is difficult to verify them. This is why there has been a decrease in research on blood pressure and dialysis. It has been thought to be difficult to establish an index that is appropriate and that can be readily understood by all staff and patients. However, after several years of consideration, in 2017, a proposal for dialysis patients was presented by the Joint Working Group of the European Society of Kidney/Dialysis Transplantation and the European Society of Hypertension, namely, an average value of 135/85 mmHg or less for home blood pressure measured in the morning and evening during 6 nondialysis days or an average blood pressure of below 130/80 mmHg measured by 24-h ambulatory monitoring on a nondialysis day during the week [7]. This is considered to be a new viewpoint, although the care of patients who cannot obtain their own blood pressure at home must be considered. Again, this report from Tsuruya et al. demonstrated that postdialysis blood pressure is also a potential indicator. Therefore, although blood pressure control indicators for dialysis patients may be a theme that was once considered to be too difficult, recent research, such as with the use of big data, is providing new clues. If we continue our steady efforts to consider each and every indicator, we should be able to establish a viable one in the near future.

Compliance with ethical standards

Conflict of interest The author received honoraria and/or fees for the promotional materials from Kyowa Kirin, Chugai Pharmaceutical, Kissei Pharmaceutical, and Fuji Yakuhin and also received research funding from Kyowa Kirin and Chugai Pharmaceutical.

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