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Current status of hemodiafiltration in Japan

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Hemodiafiltration (HDF) is a form of blood purification therapy that combines diffusive and convective transport. It has been shown that β2-microglobulin (molecular weight 11.8 kDa) and various cytokines (molecular weight 5–20 kDa) can be removed by HDF more efficiently than by conventional hemodialysis (HD), which is used for many patients undergoing dialysis in Japan. In Japan, 38.3% of dialysis patients were treated with HDF mode in 2018. Of these, 70.9% and 26.0% were treated with predilution online HDF (OL-HDF) and intermittent infusion hemodiafiltration (IHDF), respectively. OL-HDF allows dialysate to be infused as a substitution solution directly into the blood. It consists of 2 different modes, predilution OL-HDF and postdilution OL-HDF, based on the location of administration of substitution solution into the extracorporeal circuit. In predilution OL-HDF, ultrafiltration is performed after diluting blood with the substitution solution. This approach is considered advantageous in that hemoconcentration is unlikely to occur and replacement can be performed with a large volume of substitution solution, even in patients with relatively low blood flow rates. In contrast, postdilution OL-HDF involves dilution of blood by infusing substitution solution after ultrafiltration, resulting in more efficient solute clearing compared with predilution OL-HDF. However, a concentration polarization layer can be formed by hemoconcentration around the hemodiafilter or protein fraction on the filter membrane. It has been shown that as ultrafiltration progresses, the concentration polarization layer increases, resulting in excessive albumin leakage by back diffusion. The effects of OL-HDF and HD on all-cause mortality and other parameters have been analyzed in 3 large randomized controlled trials: the ESHOL study, the CONTRAST study, and the OL-HDF study. They demonstrated that among patients treated with OL-HDF, those who received a higher volume of substitution fluid per session (more than 20 L per session) had lower all-cause mortality compared with those receiving HD. Postdilution OL-HDF is more commonly used in Europe, whereas Japanese patients treated with OL-HDF, the predilution method has been used because of their low blood flow rate and low serum albumin levels. There is a lack of large-scale studies analyzing the clinical effect of predilution OL-HDF on patient survival outcomes. Last year, to investigate the efficacy of predilution OL-HDF, nationwide cohort study was conducted by the Japanese Society for Dialysis Therapy Renal Data Registry (JRDR) database. It was reported that predilution OL-HDF was associated with improved overall survival compared to HD. Among patients treated with predilution OL-HDF, those treated with high substitution volumes (more than 40.0 L per session) had improved all-cause and cardiovascular survival compared to those treated with low substitution volumes (<40.0 L per session) or those on HD. This observational study suggests that predilution OL-HDF, especially with high substitution volumes, may improve all-cause and cardiovascular survival. Furthermore, I will talk about current status of HDF and HD treatment in Japan.