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The comparison of vancomycin removal between medium cut-off (Theranova®) and high-flux dialyzer

HEA RAN LEE, JAI WON CHANG
Department of Internal Medicine-Nephrology, Asan Medical Center, University of Ulsan College of Medicine, Korea, Republic of

Objectives: For the treatment of Staphylococcus aureus infection in patients with end-stage renal disease (ESRD) on hemodialysis (HD), the maintenance of the target trough level of vancomycin (molecular weight 1,448 Dalton), 15~20 mg/L, is very important. Weight based dosing (WBD) and non-WBD protocols of vancomycin were developed on the pharmacokinetic/pharmacodynamics data of the ESRD patients using high-flux dialyzer (HFD). Recently developed medium cut-off dialyzer (MCD), Theranova®, revealed superior clearance of waste product with large middle molecular weight (LMMW, ~45,000 Dalton) than HFD. The aim of this study is to investigate whether the reduction ratio (RR) of vancomycin on MCD is greater than that on HFD.

Methods: We analyzed a prospectively collected vancomycin levels in 34 ESRD patients just before and after HD between Apr 2018 and Nov 2019. HD dialyzers were randomly assigned with the design of cross-over to the ESRD patients on HD administered intravenous vancomycin. HFD was F80® (Fresinius) or Polyflux 170H® (Baxter).

Results: There were no significant differences in the dry body weight, the level of pre-HD serum creatinine, the duration of HD session, and the amount of net ultrafiltration between two groups on HD with MCD or HFD. Although unadjusted RR of vancomycin using MCD was significantly greater than that of HFD (p = 0.036), RR of vancomycin was not significantly different between two dialyzers when adjusted for the duration of HD session (240 min).

Conclusions: Although the clearance of uremic toxin with LMMW by MCD was greater than that of HFD, there was no significant difference in the adjusted RR of vancomycin for the duration of HD session between two dialyzers. Therefore, vancomycin dosing protocol for HFD could be valid in the patients with ESRD on HD using MCD.

Table 1. Comparisons between two groups on MCD or HFD

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Variable	Medium cut-off dialyzer	High-flux dialyzer	*p*-value
Age (years)	63 (45-76)		
Sex (Male: Female)	21 (62 %): 13 (38 %)		
Height (cm)	165.0 (157.0-168.0)		
Dry body weight (Kg)	53.5 (47.9-63.6)		
Parameters of HD			
Pre-HD body weight (Kg)	53.5 (47.9-63.6)	56.4 (50.4-67.0)	0.977
Pre-HD Creatinine (mg/dL)	6.20 (4.61-9.10)	6.09 (4.27-9.03)	0.822
Duration of HD session (min)	240 (232-240)	240 (217-250)	0.731
Net UF (Kg)	1.7 (1.2-2.5)	1.8 (1.2-2.3)	0.715
Parameters of vancomycin			
Maintenance dose (mg)	600 (500-750)	500 (500-750)	0.939
Dosing interval (hours)	37.7 (17.9-44.0)	51.5 (34.0-51.0)	0.210
Pre-HD level (mg/L)	19.2 (17.0-24.4)	17.8 (15.2-22.7)	0.211
Post-HD level (mg/L)	10.3 (8.8-12.7)	10.3 (8.4-13.3)	0.778
Unadjusted RR (%)	45.9 ± 9.4	43.1 ± 12.14	**0.036**
Adjusted RR for 240 min (%)	50.4 ± 12.1	49.1 ± 13.5	0.584

Values are presented as mean ± SD, median (IQR) or number (%)