KSN 2021
FULLY VIRTUAL MEETING
September 02 (Thu) - 05 (Sun)

Abstract Submission No. : 9133

PERITONEAL DIALYSIS ADEQUACY: A PARADIGM SHIFT

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For decades, prescription of peritoneal dialysis (PD) dose has been based on a single minimal threshold of Kt/V_{urea}. Based on retrospective studies, the 1997 NKF- KDOQI recommendation was that Kt/V_{urea} be ≥ 2.0. However, this was not supported by subsequent prospective randomized trials. The ADEMEX study included 965 patients on continuous ambulatory peritoneal dialysis (CAPD) randomized either into the control group doing its usual treatments, or the intervention group where the prescription was modified to achieve a peritoneal creatinine clearance of at least 60L/week/1.73m^2. The average total Kt/V_{urea} was 1.80 in the control group versus 2.27 in the intervention group. After two years of follow up, patient survival was found to be equivalent between the two groups with a relative risk of 1.0. Another clinical trial from Hong Kong evaluated 320 CAPD patients who were randomized into one of three groups targeting Kt/V_{urea} 1.5-1.7, 1.7-2.0, and >2.0. There was no statistically significant difference in patient survival, hospitalization rate, or serum albumin after two years among the three groups. Thus, there was no benefit observed in the patients with Kt/V ≥ 2.0. However, there were more patients in the lowest Kt/V_{urea} target group who required erythropoietin treatment. Note that Kt/V values < 1.5 have not been examined. Thus, there is no clear relationship between small solute clearance and survival in PD patients. Nevertheless, based on these studies, the 2006 International Society for Peritoneal Dialysis (ISPD) guideline on prescribing PD focused on small solute clearance and stated that the total (renal + peritoneal) Kt/V_{urea} should not be less than 1.7 at any time.

Using Kt/V_{urea} to determine adequacy of peritoneal dialysis prescription poses several problems. Volume of urea distribution (V_{urea}) is generally taken to be total body water (TBW). This argues that V should be determined from ideal body weight rather than actual body weight in order to avoid overdialysis in obese patients and underdialysis in underweight patients. In an article that compared the three main methods used to estimate TBW, namely gold standard isotope dilution, bioimpedance, and anthropometric equations, the authors found wide limits of agreement among the three methods. In dialysis patients, the 95% confidence interval ranged ±12-18% of the TBW translating into a Kt/V_{urea} range of 1.4-2.1 in an individual whose TBW is 35L with a measured Kt/V_{urea} of 1.7. Based on this finding, the authors concluded that "(g)iven the uncertainty of the estimation of V, clinicians

should be encouraged to alter the prescribed dialysis dose in response to symptoms and treatment goals rather than solely equating a single value cutoff value with adequate treatment".

In 2020, ISPD published updated practice recommendations on prescribing high-quality PD which emphasized incorporation of multiple measures to assess the quality of dialysis rather than just focusing on the single value of Kt/V_{urea}. These measures include using shared decision-making between the patient and care team, assessment of health-related quality of life (HRQOL), presence of uremic symptoms, residual kidney function, volume status, biochemical measures, nutritional status, and small solute clearance. The newest recommendation states that "(i)f symptoms, nutrition and volume are all controlled, no PD prescription change is needed for the sole purpose of reaching an arbitrary clearance target." Thus clinical evaluation of a variety of clinical and biochemical parameters should be undertaken to assess the quality of dialysis being provided. Some of these factors are shown in the table below. Recognize that the data on which these recommendations were based are all retrospective observational studies; prospective trials are needed to assess the validity of these targets.

Table 1

Acid-base	Bicarbonate ≥ 24 mEq/L
Albumin	Albumin (BCG) ≥ 3.8 g/dL
Blood pressure	Systolic BP 111 – 159 mmHg
Electrolytes	Potassium 4 – 5.4 mEq/L Sodium ≥ 135 mEq/L
Hemoglobin	≥ 11 g/dL
Minerals	Calcium (albumin-corrected) 8.5 – 10.1 mg/dL Magnesium ≥ 1.7 mg/dL Phosphorus ≤ 6.3 mg/dL
Volume status	Absence of rales and lower extremity edema