Membrane Transport and Adequacy as Survival Predictors in Peritoneal Dialysis; Complimentary or Contradictory:

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Adequate peritoneal dialysis, as originally proposed by Moncreif and Popovich, was defined in terms of urea clearance. When expressed as Kt/V, theoretical constructs suggested that a weekly peritoneal Kt/V of 2.0 would be adequate for a 70kg patient without residual renal function. Prospective cohort studies using both univariate and multivariate statistical analyses support this theoretical construct. The DOQI guidelines recommend a weekly total Kt/V of 2.0. However, the assumption of equivalence of residual renal and peritoneal Kt/V has been challenged. There appears to be a stronger association of patient and technique survival with renal Kt/V than with peritoneal Kt/V. Plausible clinical explanations include better volume control with higher urine output, clearance of higher molecular weight uremic toxins and renal endocrine function. Methodologic explanations include lesser intersubject variability for peritoneal than for renal Kt/V and greater residual renal function being correlated with earlier initiation of dialysis. Although the comparative value of renal and peritoneal clearance continues to be debated, there is a general consensus that preservation of residual renal function and higher total Kt/V are desirable.

The expectation that peritoneal dialysis patients with higher peritoneal membrane transport would have greater peritoneal clearances of urea and other uremic toxins and would have better outcomes has not been supported. The opposite has been reported in most CAPD and some APD studies. Patients with higher peritoneal membrane solute transport at the initiation of dialysis have lower serum albumin values before initiation of dialysis. These patients tend to be older, more likely to be male and more likely to have diabetes mellitus. After initiation of dialysis, those with higher peritoneal membrane transport lose greater amounts of protein in the dialysate, have a further decrease in serum albumin levels and have less daily ultrafiltration. The explanations for the worse technique and patient survival among these patients include chronic inflammation, malnutrition and volume overload. There is conflicting evidence about the role of chronic inflammation. Levels of C reactive protein are not different among the transport categories defined by PET but the increase in peritoneal membrane transport observed in long term peritoneal dialysis patients may be mediated by pro-inflammatory cytokines. The lesser survival reported in CAPD patients with higher peritoneal membrane transport has not been observed in studies of APD patients or in CAPD patients using icodextran for the overnight dwells. This suggests that volume overload may be the pathogenetic mechanism.

The early higher mortality seen in peritoneal dialysis patients with higher transport may be due to a combination of associated co-morbid

conditions and diminished ultrafiltration. The latter can be addressed by use of a night time exchange device, icodextran for the long dwell or use of APD. The acquired increase in peritoneal membrane transport is associated with ultrafiltration failure in patients with decreasing residual renal function. The therapeutic response is similar.

Adequacy of peritoneal dialysis must be defined in terms of solute clearance and ultrafiltration targets. The former should address the uremic syndrome and is defined by a total weekly Kt/V of 2.0; the latter should address volume overload and should be defined by a net renal and peritoneal fluid removal to maintain a target dry weight.