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Synopsis from the article: Treatment time and ultrafiltration rate are more important in dialysis prescription than small molecule clearance. Blood Purification 2007; 25:90-98.

When chronic hemodialysis sessions were first developed in Seattle in the 1960s, they were long procedures that caused few intra- or inter-dialytic symptoms. Over the next several decades, the overwhelming number of patients requiring hemodialysis created both financial and logistical incentives to shorten dialysis sessions to as little as 2 hours per treatment, three times per week. Shorter treatments spread rapidly, especially in the United States, after the National Cooperative Dialysis Study (NCDS) findings were interpreted to suggest that the length of dialysis sessions was unimportant if Kt/V urea was maintained at 0.95–1.0. This target was later increased to 1.3, but the underlying assumption that small molecule clearance was of greater import than hemodialysis time remained unchanged.

We should abandon Kt/V urea as a measure of dialysis dose. Intrinsic to the formula is the premise that ‘t’ can be reduced if ‘K’ is increased. While this is somewhat true for urea, the behavior of urea itself in vivo does not represent other, more toxic substances. Initial acceptance of Kt/V urea was based on a false interpretation of insufficient data. In the NCDS study, the p value did not reach the statistical significance threshold (p = 0.056). However, the study was insufficiently powered due to a low number of patients, short duration (52 weeks), and the failure to examine urine output—which was likely substantial as many of the participating patients were of recent dialysis vintage. It is important to note that the absence of evidence is not the evidence of absence. In the entire history of dialysis research, rejection of the importance of dialysis session length by relying on a P value = 0.056 in the NCDS study was the most important ‘non-significant’ result—and we still feel its ill effects to this day.

Kt/V urea does not reflect the removal of larger uremic waste molecules. It does not correlate with ultrafiltration, the other important function of hemodialysis. While patients who have a substantial amount of residual renal function may be able to endure short dialysis sessions, those who have little or no urine output tolerate short treatments poorly because the ultrafiltration rate needs to be inversely proportional to dialysis time at any given inter-dialytic weight gain. Rapid ultrafiltration leads to symptoms such as severe muscle cramps, nausea and vomiting, headache, fatigue, hypotension during dialysis, and hangover afterward. Patients who receive these short treatments remain fluid overloaded, and their blood pressure control is poor—leading to left ventricular hypertrophy, diastolic dysfunction, and the high cardiovascular mortality rates that we routinely see today.

The frequency and length of dialysis treatments should be adjusted such that patients do not suffer from symptoms caused by rapid ultrafiltration, do not experience other, preventable uremic symptoms, and most patients have their blood pressure controlled without the need for the use of antihypertensive drugs.
Commentary by Todd S. Ing, MD

Dr. Twardowski maintains that just using a small molecule (urea) clearance as an index of dialysis adequacy is not warranted (1). In addition, he suggests that adequate removal of excess fluid via ultrafiltration in dialysis patients is mandatory if the myriad adverse effects of overhydration are to be avoided. Should high-intensity hemodialysis treatments be proved to be superior to the conventional thrice weekly regimen, the 1.3 Kt/V criterion and the need to remove a large amount of excess fluid over a short period of time will no longer be relevant.

Reference