

Ahmad S, Callan R, Cole J, Blagg C.

Increased dialyzer reuse with citrate dialysate. *Hemodialysis International* 2005;9:264-7.

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Dialyzer reuse is limited by the clotting of blood, which blocks the fibers and reduces the membrane surface area. Clotting during treatment may also reduce dialysis efficiency and potentially decrease delivered dose, Kt/V_{urea} . A new dialysate containing citric acid, instead of the standard acetic acid, as the acidifying agent has become available and is associated with reduced clotting during acute dialysis treatments. The effect of citric acid dialysate on dialyzer reuse was evaluated in this prospective, controlled, multicenter study involving maintenance hemodialysis patients. A total of 105 patients from five dialysis units were switched to the new dialysate and new dialyzers. Reuse outcome on the new dialysate was compared with the reuse on the regular acetic acid containing bicarbonate dialysate (controls). The overall reuse with citrate dialysate increased significantly from 15.1 +/- 9.4 to 18 +/- 10.0 (mean +/- SD) on regular and citrate dialysate, respectively ($p = 0.0003$). The most significant increase was seen in those patients who had limited reuse before the switch to citrate dialysate; 51, 59, and 134% increases occurred in those with 10 to 15, 5 to 10, and < 5 reuses at controls, respectively. Interestingly, the 10 patients with 10 or fewer reuses had significantly lower Kt/V_{urea} at baseline (before the switch to citric acid dialysate) than those with > 10 reuses (1.23 +/- 0.23 vs. 1.47 +/- 0.23, respectively, $p = 0.009$). The Kt/V_{urea} increased to 1.41 +/- 0.31 after the switch in the low-reuse group but the increase did not reach statistical significance ($p = 0.07$). The results from this study show that citric acid-containing dialysate is associated with increase in dialyzer reuse and appears to be related to reduced clotting.

Commentary by Todd S. Ing, MD

Dr. Ahmad's citrate-enriched dialysate method utilizes the addition of citric acid to the "acid concentrate" of a dual-concentrate, bicarbonate-based dialysate delivery system.¹ The amount of citric acid used is one that can provide a citrate level of 2.4 mEq/L (0.8 mmol/L) in the final dialysate. The present approach can raise not only the number of dialyzer reuse as described in the present publication but also the dose of dialysis delivered [for example, the urea reduction ratio has been found to increase from 68% to 73%.¹ The changes in plasma electrolytes including ionized calcium as a result of this novel approach have been deemed to be clinically insignificant.¹ The improvement in dialyzer performance may be related to a local anticoagulation effect of the citrate that minimizes clotting of the dialyzer fibers.

Reference

Ahmad S, Callan R, Cole JJ, Blagg CR. Dialysate made from dry chemicals using citric acid increases dialysis dose. *Am J Kidney Dis*. 2000;35:493-9.