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KSN-17-P105

The effects of substitution of acetate dialysate by citrate dialysate in central delivery hemodialysis system: a retrospective observational study

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Objectives : Citrate dialysate (CD) contains citric acid as the acidifying agent in bicarbonate hemodialysis instead of acetic acid. It is reported that the use of citrate dialysate is expected to reduce intradialytic heparin demand, intradialytic blood pressure drops and induction of proinflammatory cytokines. The objective of this study was to compare the impact of citrate hemodialysis and acetate hemodialysis on heparin demand, blood pressure and variable dialysis related biomarkers.

Methods : We retrospectively evaluated 75 patients on maintenance hemodialysis with central delivery system three times per week at one outpatient facility. Each subject underwent hemodialysis with acetate dialysate over a three-month period (8 mEq/L acetic acid, 2.65 mEq/L calcium), followed by hemodialysis with citrate dialysate over another three-month period (2 mEq/L citric acid, 2.5 mEq/L calcium). Cumulative heparin dose, hsCRP, CaxP, intact parathyroid hormone (iPTH), the change of intradialytic blood pressure and spKt/V were analyzed.

Results : The mean age of subjects was 60.5 ± 14.7 years, and 62.7% of subjects were male. Patients who received citrate dialysate required lower mean heparin dose compared to those who received acetate dialysate (AD: 1128.89 ± 1033.00 IU/session vs. CD: 786.67 ± 754.50 IU/session, $p < 0.0001$). Despite circa 30% reduction in heparin dose in citrate hemodialysis, there were no significant differences in occurrences of visual clotting requiring dialyzer changes. SpKt/V remained stable (AD: 1.59 ± 0.29 vs. CD: 1.57 ± 0.23 , $p = \text{NS}$). During citrate hemodialysis, iPTH increased from 376.4 ± 289.3 pg/mL to 488.4 ± 402.8 pg/mL ($p < 0.0001$). Phosphate ($p = 0.0099$) and CaxP ($p = 0.0394$) concentrations decreased in citrate hemodialysis. While hsCRP levels decreased in citrate hemodialysis, the difference between acetate hemodialysis and citrate hemodialysis was statistically insignificant (AD: 3.05 ± 3.71 mg/L vs. CD: 2.85 ± 3.91 mg/L, $p = \text{NS}$). There was no significant difference of intradialytic blood pressure drops between citrate and acetate dialysate.

Conclusions : The use of citrate dialysate in central delivery hemodialysis

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system required lower heparin dose compared to the use of acetate dialysate, without any significant effects on dialysis adequacy. However, the results of anti-inflammatory effect need to be confirmed in long-term studies.

Keywords : Citrate dialysate, acetate dialysate, hemodialysis, heparin, intradialytic blood pressure, intact parathyroid hormone