

Regional Citrate Anticoagulation for Continuous Kidney Replacement Therapy With Calcium-Containing Solutions: A Cohort Study

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Abstract

Objective: Regional citrate anticoagulation (RCA) is the preferred anticoagulation method for continuous kidney replacement therapy (CKRT) recommended by KDIGO. Limited availability of calcium-free solutions often imposes challenges to the implementation of RCA for CKRT (RCA-CKRT). The principal purpose of this study was to characterize the outcomes of RCA-CKRT using calcium-containing solutions.

Study design: Retrospective cohort study.

Setting & participants: We evaluated the safety and efficacy of RCA-CKRT with calcium-containing dialysate and replacement fluid used for 128 patients. A total of 571 filters and 1,227 days of CKRT were analyzed.

Exposures: Liver disease, sepsis in the absence of liver disease, and sepsis with liver disease.

Outcomes: Filter life and metabolic complications per 100 CKRT days.

Analytical approach: Linear mixed-effects model and generalized linear mixed-effects models.

Results: The majority of patients were male (91; 71.1%), 32 (25%) had liver disease, and 29 (22.7%) had sepsis without liver disease. Median filter life was 50.0 (interquartile range, 22.0-118.0) hours, with a maximum of 322 hours, and was significantly lower (33.5 [interquartile range, 17.5-60.5] h) in patients with liver disease. Calcium-containing replacement solutions were used in 41.6% of all CKRT hours and reduced intravenous calcium requirements by 31.7%. Hypocalcemia (ionized calcium < 0.85 mmol/L) and hypercalcemia (total calcium > 10.6 mg/dL) were observed in 6.0 and 6.7 per 100 CKRT days, respectively. Citrate accumulation was observed in 13.3% of all patients and was associated with metabolic acidosis in 3.9%, which was not significantly different in patients with liver disease (9.3%; P = 0.2).

Limitations: Lack of control groups that used calcium-free dialysate and replacement solutions with RCA-CKRT. Possible overestimation of filter life from incomplete data on cause of filter failure.

Conclusions: Our study suggests that RCA-CKRT with calcium-containing solutions is feasible and safe in critically ill patients, including those with sepsis and liver disease.

Keywords: Regional citrate anticoagulation (RCA); acute kidney injury (AKI); calcium-containing dialysate; calcium-containing replacement solution; circuit loss; clotting; continuous renal replacement therapy (CRRT); continuous venovenous hemodiafiltration (CVVHDF); critical illness; filter efficacy; filter life; intensive care unit (ICU); liver disease; metabolic complications; sepsis.