

CONTINUOUS RENAL REPLACEMENT THERAPY WITH REGIONAL CITRATE ANTICOAGULATION IN NEWBORNS AND SMALL CHILDREN

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Objectives

Continuous renal replacement therapy (CRRT) with regional citrate anticoagulation (RCA) in newborns and small children is challenging. Until recently, none of the dialysis monitors was specifically designed for use in small children. The risk of citrate accumulation is increased because of relative overdosing of citrate due to low body weight (BW).

We aimed to analyze the performance of citrate anticoagulation in this population at our institution.



Methods

All children up to 20 kg body weight, treated with RCA-CRRT at our institution in the 2011-2016 period for which we could retrieve data, were analyzed. Prismaflex and Multifiltrate-CiCa dialysis monitors were used, sometimes with automated RCA and sometimes with manual RCA using 4% citrate and 1M calcium chloride infusions. Data was collected regarding circuit lifetime, reasons for disconnection, metabolic complications and markers of citrate accumulation (total/ionized calcium ratio).

Table 1: Basic characteristics of patients and procedures.

Characteristic	Value
No. of patients (n)	10
Gender (n)	3 females/7 males
Age (months; range)	2.6±3.8 (2 days – 11 months)
Weight (kg, range)	4.6±2.7 (2.2 – 11)
Vascular access (n)	
double lumen catheter	7
ECMO*	3
Blood flow (ml/min, range)	46±9 (30 – 60)
Citrate dose (mmol/L, range)	2.8±0.6 (1.4 – 4.5)

*ECMO - extracorporeal membrane oxygenator

Results

In total 57 dialysis circuits were used with **mean filter lifetime** of 39±29 (range 2 - 110) h.

The **main reasons for disconnection** were: 35% clotting in the circuit, 30% patient-related (procedures, no need for dialysis, death), 16% technical reasons, 9% catheter malfunction and 10% unknown. Phosphate was added to dialysate in 23% of circuits and bicarbonate in 16%.

Increased total/ionized calcium ratio (>2.5) was observed in 6/10 patients and in 13/57 (23%) of circuits. Circuits with increased calcium ratio were performed in children with lower age (27±34 vs. 136±146 days, p = 0.01) and BW (3.3±0.5 vs. 6.3±3.0 kg, p < 0.001) and had higher blood flow (13±4 vs. 9±4 ml/min/kg BW, p < 0.001) and applied citrate load (2.5±1.2 vs. 1.4±0.6 mmol/h/kg BW, p < 0.001). Area under the ROC curve for citrate load predicting calcium ratio >2.5 was 0.82 and 1.7 mmol/h citrate/kg BW was considered the optimal cut-off value; at 3 mmol citrate/l blood, this would require to keep the blood flow below 9 ml/min/kg BW to prevent citrate accumulation.

The **over-all patient survival** was 4/10.

Conclusions

RCA-CRRT is feasible in newborns and small children using equipment, developed for the adult population. Signs of citrate accumulation develop relatively often when higher blood flows per BW are used, resulting in higher citrate load.

References

Soltysiak J, Warzywoda A, Kociński B, et al. Citrate anticoagulation for continuous renal replacement therapy in small children. *Pediatr Nephrol.* 2014; 29: 469–475.

