Clinical Impact of Regional Citrate Anticoagulation in Continuous Renal Replacement Therapy in Critically Ill Patients

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Background

Regional citrate anticoagulation (RCA) is being increasingly used in continuous renal replacement therapy (CRRT) as an alternative to heparin due to advantages concerning filter lifetime and no-systemic anticoagulation.

Despite the potential advantages, complex metabolic control to avoid side-effects have been associated to RCA, generating discrepancies about its introduction in everyday practice.

Methods

Observational retrospectively study the introduction of RCA in continuous veno-venous hemodiafiltration (CVVHDF) with a concentrated citrate solution in a Tertiary University Hospital.

Evaluate the impact of the technique on efficacy and safety, compared to well-established systemic heparin.

Performed with patients receiving CVVHDF with RCA between January 2013 and May 2016. As controls, heparin-treated patients matched by age, sex and disease severity treated in the preceding year were selected as historic controls. Filter lifetime, number of filters used, haemorrhagic complications and metabolic complications (hypernatremia, alkalosis, calcium disturbances) were recorded.

Demographic description

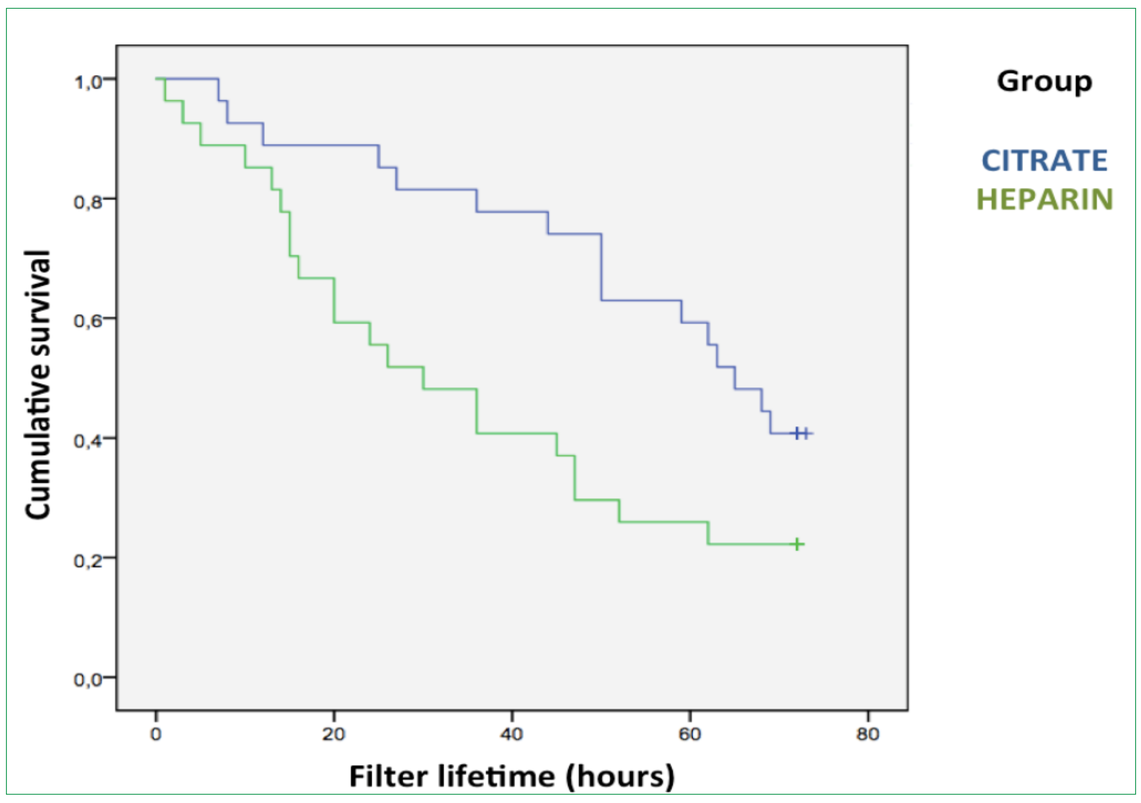
Parameter	CVVHDF-citrate group	CVVHDF-heparin group	p value
Number of patients (n)	27	27	
Age (years)	68 ± 10	71 ± 12	0.439
Gender (n, male)	19 (70%)	19 (70%)	1.00
Charlson index at initiation of CRRT	4.9 ± 1.1	5.1 ± 1.8	0.564
APACHE II score at initiation of CRRT	22 ± 5	25 ± 6	0.072
SOFA score at initiation of CRRT	11 ± 2	10 ± 2	0.238
Haemoglobin at initiation of CRRT (g/dL)	97 ± 14	95 ± 15	0.669
Platelet count at initiation of CRRT (10^9/L)	134 ± 83	166 ± 92	0.181
Serum Na^+ at initiation of CRRT (mEq/L)	138 ± 4	136 ± 6	0.268
Serum K^+ at initiation of CRRT (mEq/L)	4.2 ± 0.7	4.5 ± 0.9	0.123
Creatinine at initiation of CRRT (mg/dL)	3.7 ± 2.6	3.9 ± 2.4	0.719
Mechanical ventilation (n)	18 (66%)	21 (77%)	0.362
Antibiotic treatment (n)	25 (92%)	25 (92%)	1.00
Vasopressors use (n)	27 (100%)	27 (100%)	1.00
Vascular access			
Femoral access (n)	26 (96%)	23 (85%)	0.204
Right jugular access (n)	1 (3%)	4 (14%)	
AKI on previous Chronic Kidney Disease (n, CKD)	7 (25%)	10 (37%)	0.379
ICU admission reason			
Postoperative (n)	16 (59%)	13 (48%)	0.880
Cardiovascular cause (n)	10 (37%)	9 (33%)	
Other reason for ICU admission (n)	1 (3%)	5 (18%)	
AKI			
Ischemia (n)	17 (63%)	15 (55%)	0.625
Sepsis and mixed causes (n)	10 (37%)	12 (44%)	

Results

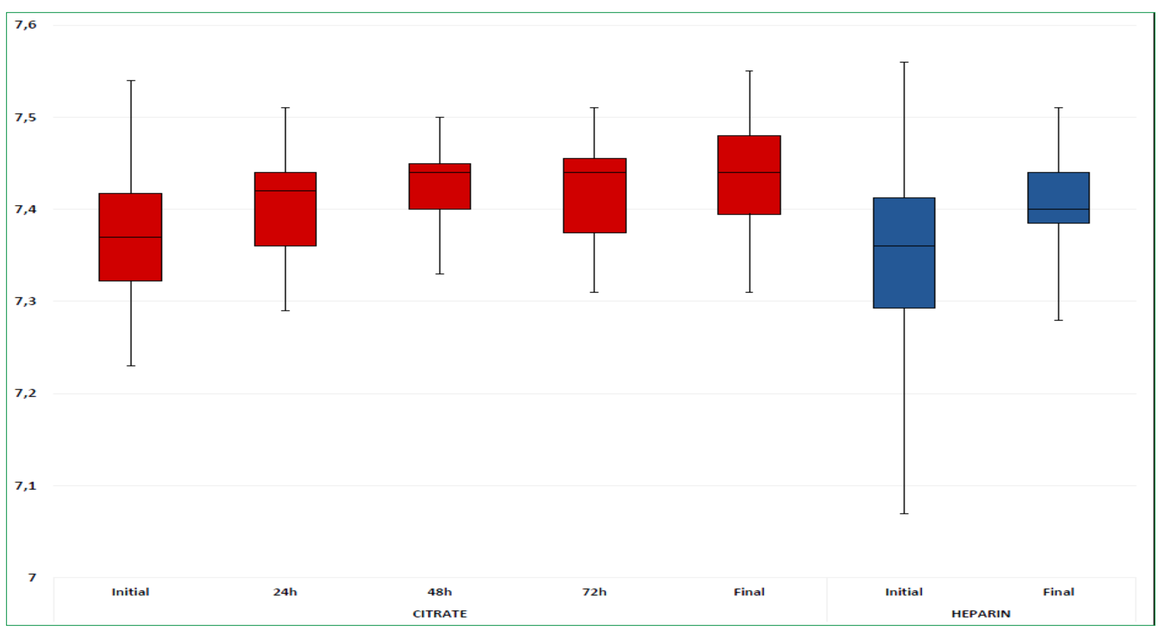
Efficacy and safety of RCA compared to heparin	CVVHDF-citrate group	CVVHDF-heparin group	p value
Elective circuit interruption of the fist filter (n)	14 (51%)	6 (22%)	
Interruption due to coagulation of the circuit (n)	9 (33%)	18 (66%)	0.013
Other causes of circuit interruption (n)	4 (14%)	3 (11%)	
First filter life-time (hours)	55.1 ± 21.8	38.8 ± 24.8	0.004
Number of filters in 72h	1.59 ± 0.7	2.48 ± 1.3	0.004
Bleeding (n)	4 (14%)	10 (37%)	0.062
Transfusion requirements <2 RBCC* (n)	20 (74%)	12 (44%)	0.027
Transfusion requirements ≥2 RBCC* (n)	7 (25%)	15 (55%)	

*RBCC: red blood cell concentrate

Survival in hours of first filter



Course of pH during CRRT



Conclusion

These results suggest that the implementation CVVHDF with RCA using concentrated citrate solutions prolongs filter lifetime, achieves a longer effective hemodiafiltration time and is a safe and feasible method

References

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