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Comparison of serum phosphate levels in critically ill patients with acute kidney injury undergoing continuous renal replacement therapy using different dialysates

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Objectives : Continuous renal replacement therapy (CRRT) is a recommended dialysis modality for hemodynamic unstable and critically ill patients with severe renal failure. This study aimed to evaluate changes in serum phosphate levels according to the dialysate used during CRRT and to determine whether the choice of dialysate solutions with different electrolyte compositions in prognosis and mortality.
Methods : We retrospectively analyzed 117 patients treated with intensive CRRT, including 70 and 47 patients who underwent CRRT with Phoxilium® and MultiBic®, respectively.
Results : By independent-samples t test, serum calcium, bicarbonate, and phosphate levels after CRRT for 72h were significantly different between the Phoxilium and non-Phoxilium groups ($P < 0.05$). The Kaplan–Meier analysis revealed no significant difference in survival between the two groups, demonstrating that the difference in serum phosphate level after 72h of CRRT did not have a significant effect on survival ($P = 0.581$). The difference in serum phosphate levels after 72h of CRRT might affect respiratory muscles; however, although cumulative survival exhibited a stepwise decrease with longer mechanical ventilation duration, the two groups did not show significant difference in survival ($P = 0.819$). The incidence of hypophosphatemia was significantly lower in the group where CRRT was performed with Phoxilium dialysate containing phosphate compared to the group where CRRT was performed with non-Phoxilium dialysate, and severe hypophosphatemia did not occur. There were no significant associations between hypophosphatemia, mortality, and duration of mechanical ventilation.
Conclusions : Selecting Phoxilium as a dialysate for CRRT should be considered to correct severe hypophosphatemia, prevent complications, and improve prognosis.

Table 1.png

Table 1. Baseline study participant characteristics at the time of continuous renal replacement therapy initiation.

Characteristic	Overall (N = 117)	CRRT Group		*P* value
		Non-Phoxilium (N = 47)	Phoxilium (N = 70)	
Age, median (range), years	70.0 (19–93)	73.0 (27–87)	69.5 (19–93)	0.637
Sex, n (%)				
Male	66 (56.4)	26 (55.3)	40 (57.1)	0.847
Female	51 (43.6)	21 (44.7)	30 (42.9)	
Number of patients on mechanical ventilation	93 (79.5)	41 (87.2)	52 (74.3)	0.091
Duration of mechanical ventilation, days (range)	11 (1–118)	9 (3–118)	11 (1–91)	0.974
Duration of ICU stay, days	14 (3–160)	19 (4–118)	13 (3–160)	0.455
Duration of hospitalization, days	57.2 (3–610)	37 (4–217)	38.5 (3–610)	0.400
APACHE II score	22 (5–43)	21 (8–43)	22 (5–40)	0.438
Duration of CRRT (days)	5 (3–31)	5 (3–31)	6 (3–31)	0.805
Duration of CRRT (h)	129 (72–751)	127 (72–751)	132 (72–751)	0.687
CRRT mode (CVVHDF)				
BFR (ml/min)	150 (120–150)	150 (120–150)	150 (120–150)	0.788
Dialysate flow rate (mL/h)	1000 (700–1500)	1000 (700–1500)	1000 (700–1500)	0.427
Replacement fluid flow rate (mL/h)	1000 (700–1500)	1000 (700–1500)	1000 (700–1500)	0.455
Dialysate flow rate/body weight (mL/kg/h)	19.0 (11.4–29.4)	19.0 (13.3–23.8)	19.1 (11.4–29.4)	0.641
Replacement flow rate/body weight (mL/kg/h)	19.0 (11.4–29.4)	19.0 (13.3–23.8)	19.1 (11.4–29.4)	0.641
Comorbidities, n (%)				
Diabetes mellitus	45 (38.5)	15 (61.7)	30 (42.9)	0.237
Hypertension	52 (44.4)	18 (38.3)	34 (48.6)	0.277
Heart failure	28 (23.9)	10 (21.3)	18 (25.7)	0.585
Ischemic heart disease	14 (12.0)	5 (10.6)	9 (12.9)	0.720
Cirrhosis	19 (16.2)	4 (8.5)	15 (21.4)	0.064
Cancer	24 (15.4)	5 (10.6)	19 (27.1)	0.030

APACHE, Acute Physiologic and Chronic Health Evaluation; BFR, blood flow rate; CRRT, continuous renal replacement therapy; CVVHDF, ; ICU, intensive care unit

Table 1.png

Table 2. Patient biochemistry profiles 24 h after continuous renal replacement therapy(CRRT) Initiation.

Characteristic (mean ± standard deviation)	Overall (N = 117)	CRRT Group		*P* value
		Non-Phoxilium (N = 47)	Phoxilium (N = 70)	
Phosphate (mEq/L)	3.3 ± 1.0	3.2 ± 1.1	3.4 ± 0.8	0.275
Albumin (g/dL)	2.8 ± 0.4	2.8 ± 0.4	2.8 ± 0.4	0.593
Calcium (mg/dL)	8.3 ± 0.8	8.7 ± 0.7	8.0 ± 0.7	<0.001
Corrected calcium (mg/dL)	9.2 ± 0.7	9.6 ± 0.7	9.0 ± 0.7	<0.001
Sodium (mEq/L)	137.8 ± 3.4	138.5 ± 2.6	137.4 ± 3.8	0.105
Potassium (mEq/L)	3.8 ± 0.4	3.8 ± 0.5	3.9 ± 0.4	0.100
Bicarbonate (mEq/L)	23.5 ± 3.1	24.2 ± 3.5	23.0 ± 2.8	0.039

Table 3. Patient biochemistry profiles 72 h after continuous renal replacement therapy (CRRT) initiation

Characteristic (mean ± standard deviation)	Overall (N = 117)	CRRT Group		*P* value
		Non-Phoxilium (N = 47)	Phoxilium (N = 70)	
Phosphate (mEq/L)	3.0 ± 1.0	2.2 ± 0.7	3.5 ± 0.7	<0.001
Albumin (g/dL)	2.8 ± 0.4	2.9 ± 0.3	2.8 ± 0.5	0.659
Calcium (mg/dL)	8.5 ± 0.9	9.2 ± 0.6	8.0 ± 0.8	<0.001
Corrected calcium (mg/dL)	9.4 ± 0.9	10.1 ± 0.6	8.9 ± 0.7	<0.001
Sodium (mEq/L)	137.5 ± 2.8	137.0 ± 2.2	137.9 ± 3.0	0.083
Potassium (mEq/L)	3.9 ± 0.4	3.7 ± 0.3	4.0 ± 0.4	<0.001
Bicarbonate (mEq/L)	24.0 ± 3.4	25.7 ± 2.8	22.8 ± 3.2	<0.001