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Impact of a novel fluid protocol on electrolytes stability in patients undergoing continuous renal replacement therapy

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Objectives: Continuous renal replacement therapy (CRRT) is the standard treatment for critically ill patients with acute kidney injury. Electrolyte disturbance such as hypokalemia or hypophosphatemia frequently occurs in patients undergoing CRRT unless dialysate and replacement fluids are adequately adjusted. Samsung Medical Center CRRT team developed a new protocol for dialysate and replacement fluid depending on serial changes in serum potassium and phosphorous to prevent electrolyte disturbance during CRRT. The impact of our new fluid protocol on electrolyte stability was evaluated.

Methods: Adult patients who received CRRT for 3 days or more during the previous two years (2013 to 2014; pre-protocol group) and the two years (2016 to 2017; post-protocol group) following the development of the fluid protocol were compared. Individual coefficient of variation (CV) was calculated and the number of abnormal measurements for potassium and phosphorus were recorded. The Wilcoxon rank sum test was used for analysis.

Results: A total of 1456 patients were included. Both potassium level (pre-protocol group vs. post-protocol group, median [IQR], mmol/L; 3.8[3.6 - 4.2] vs. 4.2 [3.9 - 4.5]) and phosphorus level (mg/dL; 3.0 [2.4 - 3.8] vs. 3.2 [2.7 - 3.9]) were higher in the post-protocol group. CV of potassium was lower in the post-protocol group (0.104 [0.081 - 0.135] vs. 0.085 [0.064 - 0.110], $p < 0.0001$). CV of phosphorus was also lower in the post-protocol group (0.275 [0.207 - 0.358] vs. 0.229 [0.169 - 0.304], $p < 0.0001$). The event rate of abnormal potassium levels (0.192 [0.077 - 0.333] vs. 0.047 [0.000 - 0.143], $p < 0.0001$) and phosphorus levels (0.414 [0.267 - 0.571] vs. 0.286 [0.133 - 0.462], $p < 0.0001$) were lower in the post-protocol group.

Conclusions: This CRRT fluid protocol resulted in excellent stability of serum potassium and phosphorus levels during CRRT.