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Importance of intracellular water removal during continuous renal replacement therapy in patients with acute kidney injury

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Objectives: Fluid overload is associated with worse patient outcome in acute kidney injury (AKI) patients and adequate fluid removal is associated with fair clinical outcome. It had been speculated that, during the volume reduction therapy, excess fluid would be removed from both extracellular and intracellular compartment due to the inter-compartmental fluid shift. However, there were few studies that observed inter-compartmental fluid shift in AKI patient and revealed its clinical significance. This study is aimed to assess this issue in patient with AKI underwent continuous renal replacement therapy (CRRT) using multifrequency bioimpedance analysis (MF-BIA).

Methods: We prospectively collected AKI patients who needed CRRT more than three days in 3rd affiliated Hospital. During the study period, we measured the amount of total body water (TBW), intracellular water (ICW) and extracellular water (ECW) at the time of CRRT initiation (D1) and three days after CRRT operation (D3). TBW, ICW and ECW were adjusted with height² and the removed volume was calculated by measured volume at D3 minus measured volume at D1.

Results: Among the 336 included patients, 40.2% were dead. After 3-days of CRRT treatment, TBW/H² was equally decreased in survivors and non-survivors. However, ICW/H² volume was more removed in survivors than in non-survivors ($-0.21 \pm 0.87 \text{ L/m}^2$ in survivors, $-0.02 \pm 0.97 \text{ L/m}^2$ in non-survivors, $p=0.063$). When we performed multivariable analysis, a less removed ICW/H² volume was a significant factor predicting patient survival (OR 1.232(1.002-1.481), $p=0.027$) along with the lower serum albumin, creatinine level, lower BMI and presence of cancer at the time of CRRT initiation.

Conclusions: Less ICW/H² removal detected by MF-BIA was associated with patients' death. This might be associated with inadequate inter-compartment fluid shift during volume reduction therapy. Further research should be needed.