

Clinical significance of serum albumin monitoring during continuous renal replacement therapy

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Introduction

Hypoalbuminemia at the start of continuous renal replacement therapy (CRRT) is a risk factor for poor patient outcomes. However, little is known regarding changes in serum albumin levels during CRRT, or whether the pattern of change can provide additional information to predict patient outcomes.

Methods and Materials

This was a retrospective study based on data collected consecutively from January 2016 to December 2020 at the Third Affiliated Hospital.

We included acute kidney injury patients who received CRRT more than 72 hours. We divided the patients into four groups based on their serum albumin level at the initiation and termination of CRRT: persistently low (albumin < 3.0 g/dL at initiation and < 3.0 g/dL at termination), increasing (albumin < 3.0 g/dL at initiation and ≥ 3.0 g/dL at termination), decreasing (albumin ≥ 3.0 g/dL at initiation and < 3.0 g/dL at termination), and persistently high (albumin ≥ 3.0 g/dL at initiation and ≥ 3.0 g/dL at termination).

The patients' in-hospital mortality and length of stay in the intensive care unit (ICU) were compared.

Results

The mean serum albumin level at the start of CRRT was 3.05 ± 0.67 g/dL. During the median 5 (3–8) days of CRRT, patients' serum albumin levels changed (Fig 1).

Of the 793 patients included, 299 (37.7%) were categorized into the persistently low, 85 (10.4%) into the increasing, 195 (24.6%) into the decreasing, and 214 (27.10%) into the persistently high albumin groups (Table 1).

The in-hospital mortality rates were highest in the persistently low and decreasing groups, followed by the increasing and persistently high groups. The hazard ratio (HR) for in-hospital mortality was 51.9% lower in the increasing group [(HR 0.481 (0.340, 0.680))] compared to the persistently low group, while the HR for in-hospital mortality was 190% higher in the decreasing group [(HR 1.911 (1.394, 2.620))] compared to the persistently high group.

The length of ICU stay was longer in the persistently low group by 3.55 days compared to the persistently high group after adjusting for age, Sequential Organ Failure Assessment score, and CRRT duration.

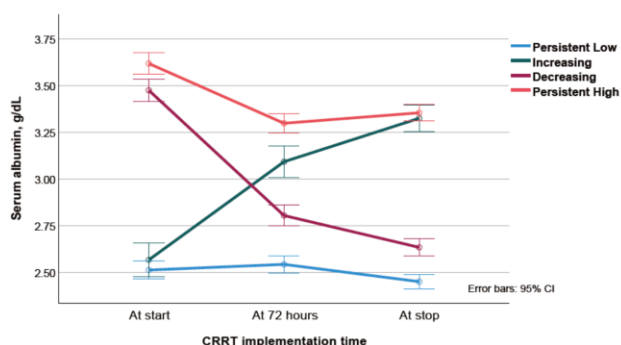
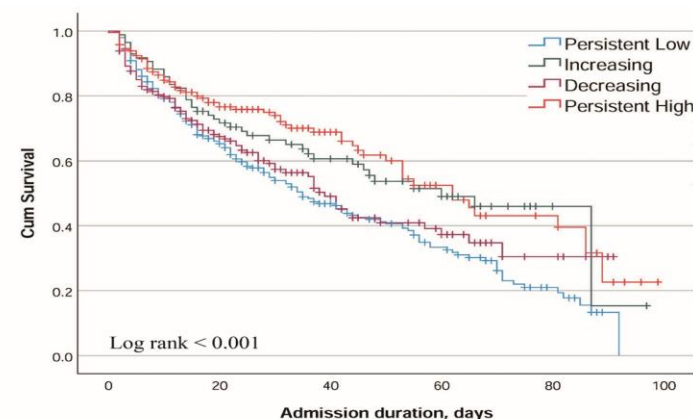


Figure 1. Patterns of serum albumin change during CRRT

Results

Table 1. Differences in patient outcome by albumin change pattern

	Number of patients (N, %)	Inhospital mortality (N, %)	Length of ICU stay, days
Persistent High (sAlb at initiation ≥3 g/dL sAlb at termination >3 g/dL)	299(37.7)	175(59.1)	12(6,23)
Decreasing (sAlb at initiation ≥3 g/dL sAlb at termination <3 g/dL)	85(10.4)	41(48.2)	16(10, 30)
Increasing (sAlb at initiation <3 g/dL sAlb at termination ≥3 g/dL)	195(24.6)	90(46.2)	10(6, 17)*
Persistent Low (sAlb at initiation <3 g/dL sAlb at termination <3 g/dL)	214(27.1)	72(33.8)	9.5(6, 15)*
Total	793(100)	378 (47.9%)	11 (6–20)



No. of patients	193	94	46	17	7	0
Persistent High	193	94	46	17	7	0
Increasing	82	57	36	19	3	0
Decreasing	190	102	37	19	4	0
Persistent Low	283	151	75	39	12	0

Figure 2. Kaplan-Meier survival curve showing differences in in-hospital mortality according to the serum albumin change pattern

Discussion

The strength of this study is that it is the first to show the clinical usefulness of serum albumin monitoring. Having an increased serum albumin level > 3 g/dL at termination of CRRT predicted a better patient outcome compared to having persistent low albumin level. A decrease in serum albumin levels during CRRT was more common in older and septic patients, and a decrease in serum albumin level to < 3 g/dL by the end of CRRT predicted a worse patient outcome compared to a consistently high serum albumin level. Further study is needed to identify the determinants of an increase or decrease in serum albumin during CRRT.

Conclusions

Serum albumin levels changed during CRRT, and monitoring of serum albumin provided additional information for predicting in-hospital mortality and duration of ICU stay.

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