Early Renal Replacement Therapy in Severe Pneumonia Associated Acute Kidney Injury

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Introduction

Pneumonia is one of the crucial issues in the development of acute kidney injury (AKI), especially severe pneumonia. This study is to evaluate the efficacy of early renal replacement therapy for the treatment of severe pneumonia-associated AKI.

Methods and Materials

In this real-world, retrospective cohort study, we recruited 180 patients with severe pneumonia, hospitalized in a third-class general hospital in East China between January 1st, 2017 to December 31st, 2021. Clinical data on baseline characteristics, biochemical indicators, and data on renal replacement therapy were collected. Patients were divided into Early and Late RRT groups mainly according to the fluid status, progression of inflammation and pulmonary radiology **(Table 1).** We investigated the in-hospital all-cause mortality (the primary end point) and renal recovery (the secondary end point) between the two groups.

Table 1. Definition of early and late RRT

	Early RRT	Late RRT
Basic renal function	CKD stage ≥3	
Fluid status	SCr criteria for AKI 1–2 stage; UO ≤0.5 mL/kg/h ≥6 h; PFO>1%; Mild to moderate pulmonary edema	Scr criteria for AKI 3 stage; UO ≤0.3 mL/kg/h ≥24 h or anuria ≥12h; Multiple cavity effusion; Congestive heart failure; Severe pulmonary edema or refractory hypoxemia
Inflammation	PCT ≥3 or CRP ≥90	
Radiology	Radiographic progression within 72h after treatment	
Metabolism		K+ ≥6.5 mmol/L or severe metallic acidosis, pH ≤7.2
Hemodynamics		Persistent hypotension with high dose vasoactive drugs: [norepinephrine >0.4 μg/kg/min, epinephrine >0.2 μg/kg/min or epinephrine + (norepinephrine/2) >0.2 μg/kg/min]

Results

Among the 154 patients finally recruited, there were 70 patients in Early RRT group and 84 patients in late RRT group. The duration of admission to RRT initiation was significantly shorter in Early RRT group [2.5（1.0, 8.75） vs. 5（1.5,13.5） d, P=0.027]. At RRT initiation, patients in Early RRT group displayed a lower percent fluid overload, lower doses of vasoactive agents, higher level of CRP and higher rate of radiographic progression than those in Late RRT group.

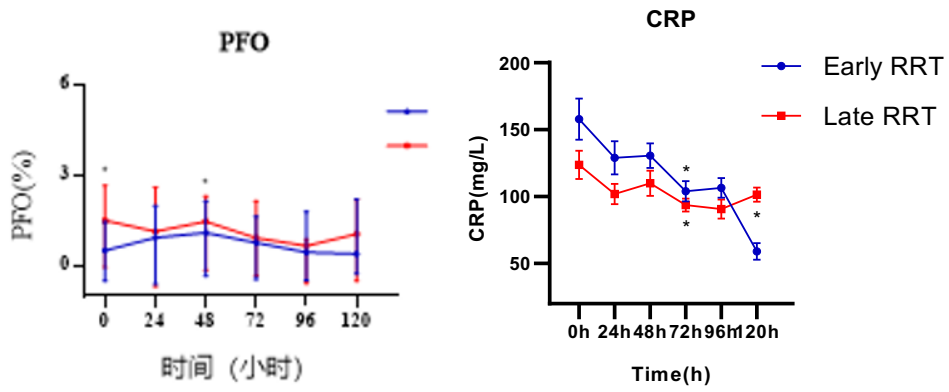
The all-cause of in-hospital mortality was significantly lower in Early RRT group than in Late group (52.5% vs. 86.5%, p＜0.001). （**Table2**）

Table 2. Comparison of Clinical Outcomes Between the two Groups

	Early RRT（n=80）	Late RRT（n=74）	P
All-cause of mortality, n (%)	42(52.5)	64(86.5)	＜0.001
Kidney function （discharge）			
Urinary output, mL	752.72±913.55	362.76±506.52	0.002
SCr, μmol/L	155.38±98.72	217.46±134.38	0.001
Kidney recovery, n (%)			0.003
Complete recovery	32(40.0)	6(8.1)	
Partial recovery	8(10.0)	6(8.1)	
No recovery	40(50.0)	62(83.8)	

There was a trend of decreasing PFO and CRP levels in the Early RRT group throughout the first 120 hours after RRT initiation, and there were few changes in Late RRT group.

Figure 1. Evolution of parameters over time. The asterisk (*) indicate P<0.05, compared with 0 h.



Conclusions

This study clarified that early RRT based on fluid status and inflammation progression for the treatment of severe pneumonia-associated AKI, was associated with reduced hospital mortality and better recovery of renal function. This may benefit from the accelerated achievement of fluid balance, removal of inflammatory mediators, and correction of electrolyte imbalance.