Characteristics And Outcomes Of Critically Ill Patients With Severe Acute Kidney Injury And Liver Dysfunction: Results From InSEA-RRT Study

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Introduction

Acute kidney injury (AKI) can occur in patients with acute or chronic liver diseases. Meanwhile, AKI can aggravate hepatic dysfunction and both entities can complicate critically ill patients with systemic diseases. We aimed to evaluate short-term and long-term outcomes in critically ill patients with concomitant severe AKI and liver dysfunction.

Methods and Materials

This was a secondary analysis from the InSEA RRT registry-a prospective cohort study. We included critically ill patients with stage 3 AKI as defined by Kidney Disease: Improving Global Outcomes (KDIGO) and liver dysfunction at King Chulalongkorn Memorial Hospital. Liver dysfunction by primary liver disease included acute liver failure (ALF), acute-on-chronic liver failure (ACLF) and acute decompensated cirrhosis (AD). Secondary liver injury was defined as an acquired liver injury (bilirubin > 2 mg/dL or transaminase > 5 times of ULN) without underlying liver disease. The primary outcome was mortality at 28 days or hospital discharge.

Results

A total of 243 patients were included in the analysis. The mean age was 61 years (±18); 61% were male and 30% had baseline chronic kidney disease (CKD). Fifty-nine (22%) patients had primary liver disease; ALF (5.1%), ACLF (40.7%) and AD (54%), whereas 184 (75%) patients had secondary liver injury. Renal replacement therapy (RRT) was initiated in 209 (86%) patients. At 28 days, 147 (60%) patients died and 38 (40%) of survivors remained on dialysis. Multivariable analysis showed hepatic encephalopathy, RRT, low serum albumin, and low baseline serum creatinine to be associated with 28-day mortality. Extracorporeal liver support was performed in 13 (5%) patients, and only 3 patients received liver transplant. Cause of liver dysfunction was not associated with an increased risk of death (OR 0.74; 95%CI 0.36-1.52; p=0.412). In patients who received continuous renal replacement therapy (n=186), non-survivors were likely to have a lower therapy time and receive no-anticoagulants than survivors. At 1 year, 208 (85.6%) developed $MAKE_{365}$, comprising death (96.7%), RRT (0.5%), and doubling of serum creatinine (1.9%).

Table 1 Patient characteristics

Variables	Total (N=243)
Age, years, mean (SD)	61±18
Male sex, n (%)	147 (60.5)
Chronic kidney disease, n (%)	73 (30.0)
Glasgow coma score, mean (SD)	9±4
APACHE II score, mean (SD)	22±8
SOFA score, mean (SD)	13±4
Ventilator used, n (%)	221 (91.0)
Vasopressor used, n (%)	200 (82.3)
CPS, mean (SD)	8±2
MELD, mean (SD)	27±9
Ammonia (µg/dL), median (IQR) (n=33)	111(81,179)
Bilirubin (mg/dL), median (IQR)	3.3(1.3,7.4)
Baseline creatinine (mg/dL), median (IQR)	0.94 (0.76, 1.42)
AKI diagnosis creatinine (mg/dL), median (IQR)	2.51(1.68,3.75)
Alb (g/dL), mean (SD)	3±0.6
Lactate (mmol/L), median (IQR)	3.8(1.9,7.5)
AST (U/L), median (IQR)	181 (65,628)
ALT (U/L), median (IQR)	80 (28,347)
Bicarbonate (mmol/L), median (IQR)	17 +/- 7
Urine output day 1 (mL), median (IQR)	271 (70, 725)
Urine NGAL (ng/mL), median (IQR) (n=113)	1599 (645,3303)
Liver dialysis, n % (SPAD, DPMAS, HVPE)	13 (5.4)
Liver transplant, n (%)	3 (1.2)
Cause of AKI, n (%)	
Liver	41 (16.9)
Sepsis	119 (49.0)
Cardiovascular	96 (39.5)
Renal hypoperfusion	23 (9.5)
Nephrotoxic	28 (11.5)
Renal replacement therapy, n (%)	209 (86.0)
Mode of Renal replacement therapy, n (%)	
IHD	2 (0.9)
CRRT	184 (82.9)
SLED	36 (16.2)
CRRT dosing (mL/kg/h)	
Total, median (IQR)	28 (16,45)
≥40, n (%)	157(64.61)
Anticoagulant used, n (%)	
Regional citrate	62 (32.1)
Heparin	22 (11.4)
NSS flush	108 (56.0)
Fluid balance day 1 (mL), median (IQR)	1279 (-106,2847)
Fluid balance day 3 (mL), median (IQR)	-61 (-1152,1326)
Fluid balance day 7 (mL), median (IQR)	-222 (-1306,500)

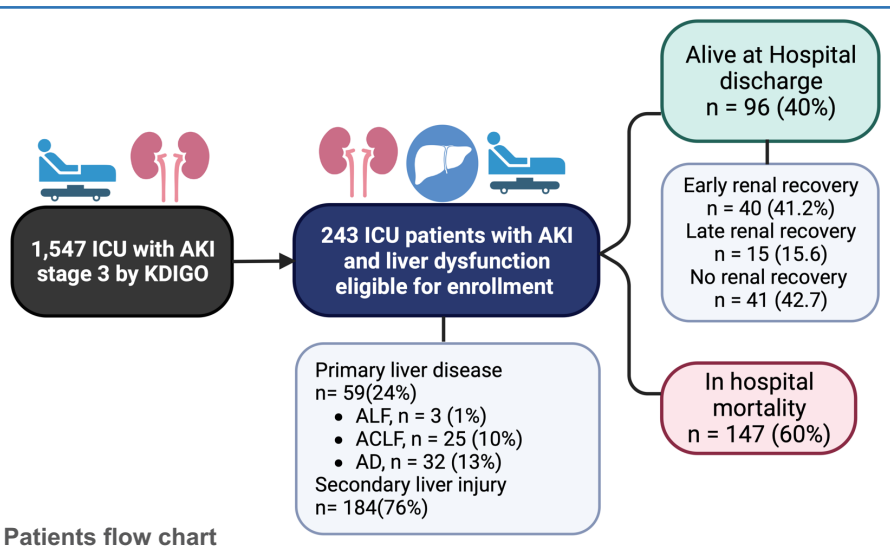

Figure 1 Patients flow chart

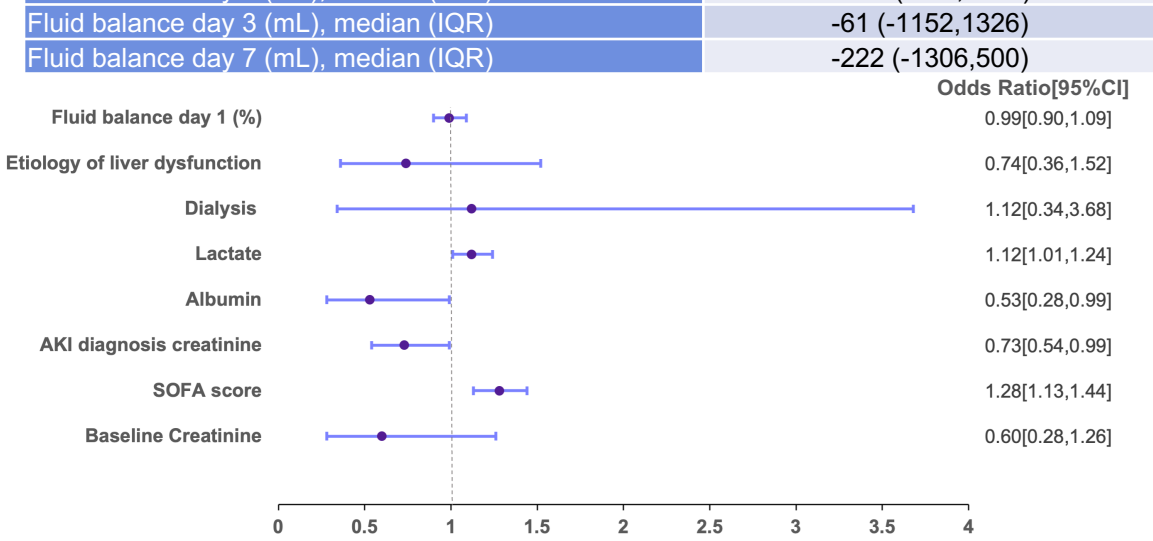

Figure 2 Multivariable Cox Regression Analysis for mortality at 28 days or hospital discharge

Conclusions

Patients with concomitant AKI and liver dysfunction have poor kidney outcomes and high mortality. In resource-limited settings, further studies are needed to determine optimal RRT-related factors to improve outcomes in this high-risk group of patients.

THE 28TH INTERNATIONAL CONFERENCE ON
ADVANCES IN CRITICAL CARE NEPHROLOGY
AKI & CRRT 2023
MARCH 29 - APRIL 1 SAN DIEGO, CALIFORNIA