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THE APPLICATION OF CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) BEYOND ACUTE KIDNEY INJURY (AKI) AMONG CRITICALLY ILL CHILDREN WITH MALIGNANCY

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Background: The role of CRRT has been expanding beyond acute renal support in recent years. Children with malignancy are at risk of developing various conditions requiring CRRT in addition to AKI. We described our experience of applying CRRT for non-AKI indications in a newly established children's hospital.
Method: The medical records of oncology patients requiring CRRT for non-AKI indications in the Hong Kong Children's Hospital between 3/2019 to 9/2020 were reviewed.

Result: Three patients were identified (Table 1 and Figure 1). Except mild electrolytes disturbance, no major CRRT-related complication was encountered.
Patient 1: A 17-year-old girl with relapse of B-cell acute lymphoblastic leukaemia (ALL) developed refractory lactic acidosis with peak lactate level 18mmol/L and lowest pH and bicarbonate level 7.13 and 6.0mmol/L. High-volume haemodiafiltration was started as a bridging therapy before chemotherapy started to work. The measured mean lactate clearance was 65ml/kg/hour.
Patient 2: A 15-year-old male with T-cell ALL developed peritonitis and pneumoperitonium complicated with Klebsiella pneumoniae septicaemia. He remained critically ill despite multiple anti-microbials, high dose inotropes and a dose of intravenous immunoglobulin. Hence haemoperfusion using the Oxiris® filter was performed for endotoxin removal. The inotropes were then weaned off, and his condition was gradually stabilized. Resection of the remaining necrotic small bowel was performed 3 days later.
Patient 3: An 8-year-old boy with bone marrow transplantation received for B-cell ALL gradually developed conjugated hyperbilirubinaemia with peak total and direct serum bilirubin level up to 305 and 263μmol/L due to veno-occlusive disease (VOD) and graft-versus-host disease (GVHD). He received a session of single-pass albumin dialysis (SPAD) using 4% albumin as dialysate as a temporary measure to reduce his bilirubin level, bridging him to receive a liver biopsy that confirmed the diagnosis of hepatic acute VOD and GVHD.

Figure 1: Effectiveness of CRRT treatment

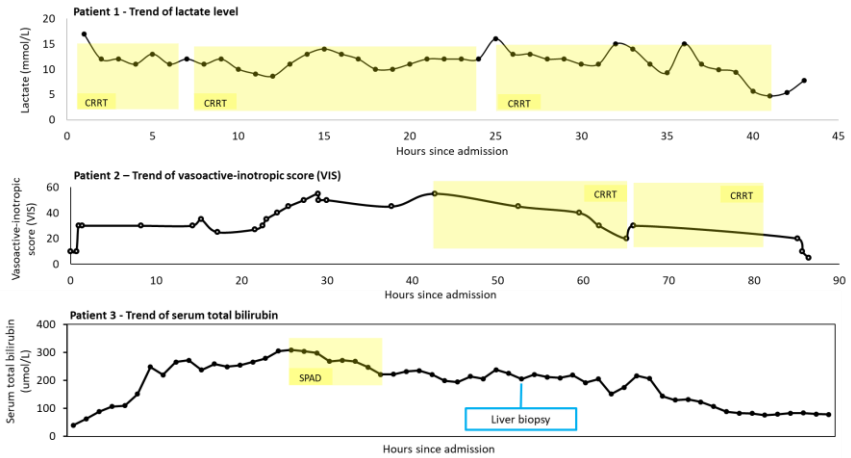

Table 1: Clinical characteristics and CRRT parameters of the three patients

Variable	Patient 1	Patient 2	Patient 3
Clinical features			
Age (year)	17.1	15.4	8.5
Sex	Female	Male	Male
Indication for CRRT	Lactic acidosis	Sepsis / Cytokines storm	Hyperbilirubinaemia
Pre-CRRT Fluid overload (%)	-1.6% (over 12 hours)	+1.4% (over 24hours)	-2.6% (over 24 hours)
Pre-CRRT urine output (ml/kg/hour)	3.8 (over 12 hours)	3.7 (over 24 hours)	0.04 (over 24 hours)
PIM3 predicted mortality (%)	6.2	31.4	5.9
Pre-CRRT creatinine (μmol/L)	29	45	55
Pre-CRRT eGFR (ml/min/1.73m²)	210.2	133.8	45.6
Need for mechanical ventilation	No	Yes	No
Need for inotropes	No	Yes	No
CRRT parameters			
Technique	High volume haemodiafiltration	Haemoperfusion	Single-pass albumin dialysis
Receiving conventional CRRT prior to treatment	No	No	Yes
Time to intervention (hour)	11.9	48	203.8
Filter	ST100	Oxiris®	ST100
Mean blood flow rate (ml/kg/min)	4.7	4.1	3.7
Mean replacement rate (ml/kg/hour)	21.4	32.5	23.0
Mean dialysate rate (ml/kg/hour)	72.7	32.2	30.3
Mean dose (ml/kg/hour)	94.8	56.6	59.2
Maximal dose (ml/kg/hour)	111.1	73.2	60.0
Anti-coagulation	Heparin	Nil	Nil
Treatment duration (hour)	160.9	37.0	42.1

Dose = replacement rate + dialysate rate (ml/kg/hour)

Conclusion: The role of CRRT in managing various complications of children with oncological diagnosis has expanded beyond traditional renal indications, and selected patients can be benefited from these techniques. However, the optimal dose, timing of initiation and monitoring target are largely unknown.

38th Vicenza Course on AKI&CRRT
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