Lecture 3

Acute kidney injury in the ICU And CRRT

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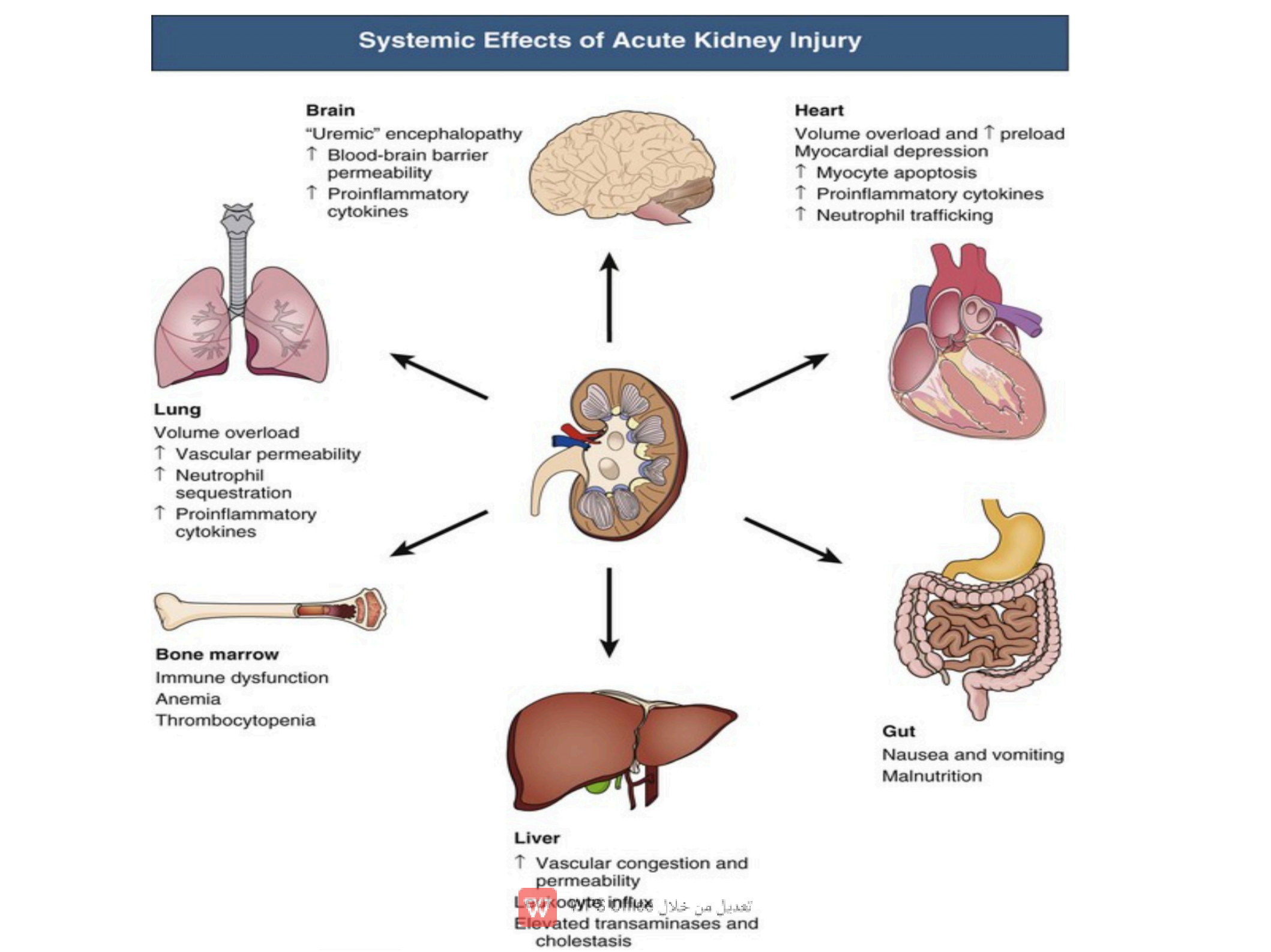
2025_2026

Acute kidney injury (AKI) is a common complication in critically ill patients and is associated with high morbidity and mortality.

- One of the commonest reasons is due to renal hypoperfusion which can be secondary to shock.
- It is a common occurrence to see a patient with acute kidney injury secondary to sepsis or diarrhoea and vomiting.
- especially common in the elderly.

A diagnosis of AKI may be made if there is a rise in serum creatinine of 26 micromol/L or greater within 48 hours.

Systemic Effects of Acute Kidney Injury



Initial Management of acute kidney injury(AKI)in the ICU focuses on the:_

1_underlying cause

2_optimizing fluid balance

3_correcting electrolyte abnormalities

4_avoiding further kidney damage

Further management :_

* identifying and treating the cause

* stopping nephrotoxic drugs

* monitoring urine output and lab values closely

* considering renal replacement therapy(RRT)if the patient doesn't improve.

Initial stabilization and assessment

* Assess and stabilize the patient
* Conduct a thorough **history** and **physical exam** and simultaneously address any life-threatening issues ,such as severe hyperkalemia.

* **Monitor fluid balance**

•Ensure a **urinary catheter** is in place and monitor urine output hourly.

•Patients may need **IV fluid resuscitation** if they are volume-depleted.

* Perform **laboratory tests**:

a complete set of electrolytes ,urea ,and creatinine(U&E)samples.

A venous or arterial blood gas can provide quicker assessment of potassium and acid-base status.

•Conduct **imaging** :An ultrasound of the renal tract is advised to rule out obstructions ,even in pre-renal cases.

* Stop **nephrotoxic agents** :Discontinue any nephrotoxic medications , including certain antibiotics and NSAIDs.

*** Adjust the dosage of renally excreted medications appropriately.**

* Manage **hemodynamics** :For septic shock ,use vasopressors like norepinephrine to achieve a mean arterial pressure of 70–65 mmHg, or a higher target in patients with chronic hypertension

* Treat **high potassium** with insulin and dextrose infusions.

The underlying cause of the AKI must be identified and treated.

* **Diuretics** are recommended for managing volume overload but not to treat or prevent AKI.

* **Monitor closely** : *Reassess the patient at least twice a day ,with more frequent monitoring if needed .

* Repeat **blood tests** at least every 12 hours.

* **Evaluate nutritional status** :The patient's nutritional needs should be assessed and managed based on their specific condition.

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Advanced Kidney Care with (Continuous Renal Replacement Therapy)

CRRT Technology

for patients with renal failure & multi organ failure

Renal replacement therapy(RRT)

The decision to start RRT is often based on clinical factors like fluid overload ,severe azotemia ,hyperkalemia ,or severe metabolic acidosis.

Continuous Renal Replacement Therapy(CRRT):_

is a slow-24 ,hour dialysis treatment for critically ill patients with acute kidney injury(AKI)that removes waste ,toxins ,and excess fluid from the body.

Unlike standard ,intermittent dialysis ,CRRT is a continuous process that uses a machine to filter the blood through a special membrane , making it a gentler and more adaptable treatment for patients who are too unstable for 4-3 hour sessions.

CRRT Involves

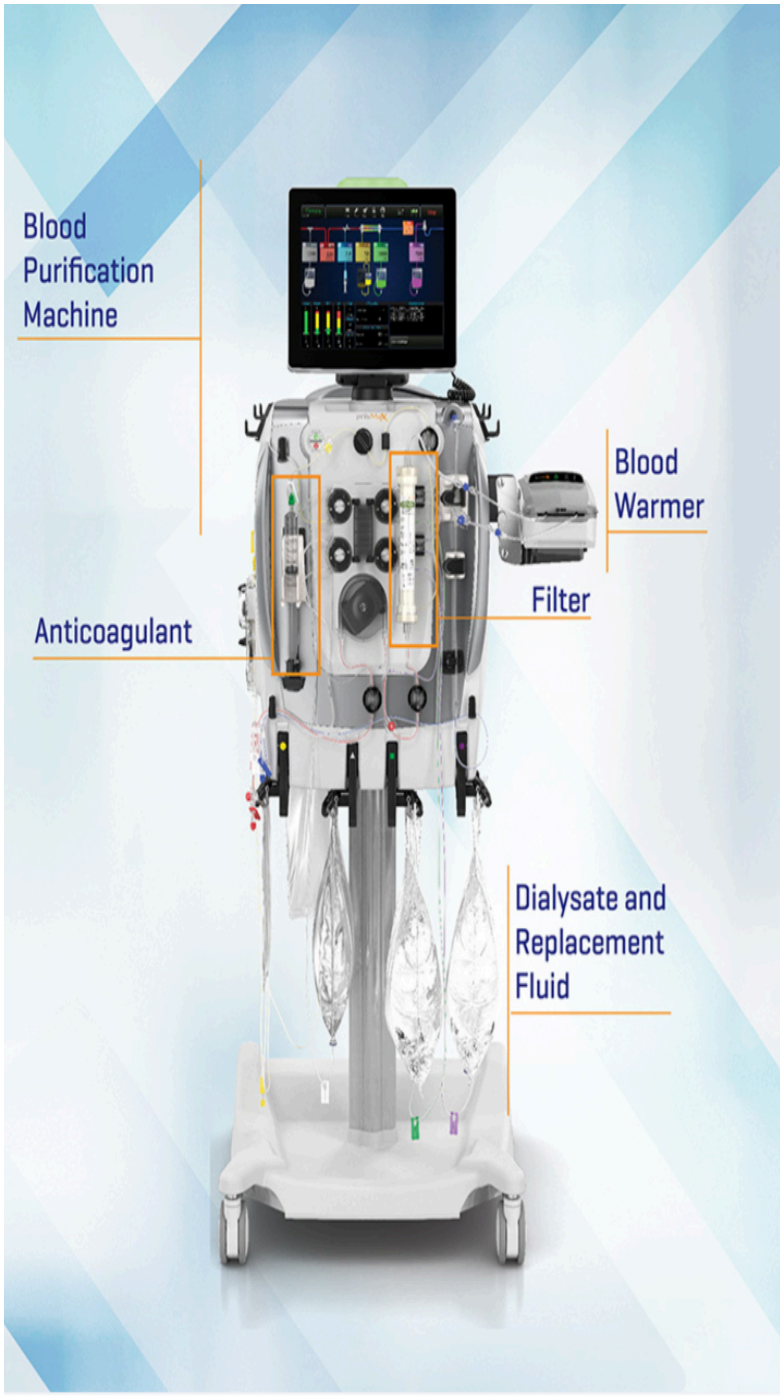
Hemodialysis Catheter :A large IV catheter is placed in a large vein ,usually in the neck or groin ,to allow blood to flow in and out of the CRRT machine.

Blood Purification Machine :This machine pumps the blood through a filter and controls the process.

Filter :A component that removes waste products and fluid from the blood.

Dialysate and Replacement Fluid :Sterile fluids are used to carry away toxins and to replace electrolytes and fluid lost during the filtration process.

Anticoagulation :A method to prevent blood from clotting in the filter ,often using heparin or citrate.



Types of RRT

1)**Continuous renal replacement therapy(CRRT :)**This is the preferred option for hemodynamically unstable patients ,as it allows for continuous fine-tuning of fluid balance and better management of solute removal.

2)**Intermittent hemodialysis(IHD :)**This can be used for hemodynamically stable patients ,with sessions lasting 4-3 hours.

3)**Sustained low-efficiency dialysis(SLED :)**This" hybrid "method uses standard dialysis hardware for longer periods 12-6(hours)at lower flow rates.

* **most common complication** of CRRTare **hypotension** at the time of connection and **electrolyte disturbances**. Strict control and continuous monitoring of the technique are therefore necessary in children on CRRT

Advantages of CRRT

* Promotes hemodynamic stability
* Better fluid balance control
* Improved metabolic control
* Removal of inflammatory mediators
* Potential for improved renal recovery
* Reduced risk of cerebral edema

Disadvantages of CRRT

* High cost and complexity
*Requires anticoagulation
* Prolonged patient immobilization
* Nutrient and drug removal
* Electrolyte imbalances
* Catheter-related complications :infection ,bleeding ,and blood clots at the insertion site.
* Inadequate therapy delivery
* Hypothermia