



Case 1 Postoperative reduction in urine output



New terms

Auscultation: (based on the Latin verb auscultate "to listen") is listening to the internal sounds of the body

Coherently: Easy to understand

Fluid overload: is the medical condition where there is too much fluid in the blood. The opposite condition is hypovolemia

Nephrostomy: is an artificial opening created between the **kidney** and the **skin**, which allows for the diversion directly from the upper part of the urinary system (**renal pelvis**).

Palpable: able to be touched or felt.

Percussion: is a method of tapping on a surface to determine the underlying structure, and is used in examinations assess the condition of the **thorax** or **abdomen**.

Urine output: The amount of urine excreted by the kidneys.

Tenderness: is pain or discomfort when an affected area is touched.

Urinary catheter: It is a tube placed in the body to drain and collect urine from the bladder.

Uremia: Urea in the blood.

Refractory: Difficult to control or deal with.

Scenario

Saleh a 65-years old businessman has been suffering from painful knee joint for many years due to **osteoarthritis**. Lately he noticed his mobility has decreased significantly and visited his doctor. The doctor told that he requires **knee replacement** due to the **excessive damaged knee joint**. During the surgery, he suffered from an **excessive blood loss** and his **BP dropped suddenly**. He went into **hypovolemic shock**, which was corrected by blood transfusion. Post-operatively, **his urine output decreased to 300 ml**. The surgeon decided to seek advice from consultant nephrologist.

Examination

- He is conscious and not distressed and tends to sleep most of the time and speaks coherently.
- **Cardiovascular system:** Normal 1st and 2nd heart sound no added sound or murmur.
- **Respiratory system:** Lungs are clear to percussion and auscultation.
- **Abdominal examination:** No tenderness, The liver and spleen were not palpable.

Investigation

*Height: 182 cm *Body weight: 86 Kg *JVP was low

Vital sign	Result	Normal
pulse	116/min	60-100/min
blood pressure	90/55 mmHg	130/80 mmHg
Temperature	37.0 C	36.6-37.2 C
Respiratory rate	15/min	16-22/min

	Result	Normal range
Hemoglobin	70 g/L	Male: 135-175 g/L (13.5-17.5 g/dl) Female: 120-155 g/L (12-15.5 g/dl)
White cell count	5.6 x10 ⁹ /L	4.5-11 x 10 ⁹ /L
Platelet count	198 x10 ⁹ /L	140-450 x10 ⁹ /L

Diagnosis

Acute kidney injury (acute renal failure) due loss of blood

Management

- 1- Optimization of hemodynamic & volume.
- 2- Avoidance of further renal insults.
- 3-Optimization of nutrition.
- 4- Renal replacement (if necessary)
- 5- Monitoring renal function (serial creatinine)

Function of kidney

- Regulation of water and **electrolyte balance**.
- Regulation of body fluid osmolality & electrolytes.
- Excretion of waste products (**UREA, CREATININE, URIC ACID**).
- Regulation of arterial blood pressure (RAS, excretion of excess salt and water).
- Regulation of acid/base balance. by **Reabsorption** of **filtered bicarbonate** **Excretion of the fixed acids**
- Detoxification and excretion of drugs.
- Production of, **Erythropoietin** Renin and **gluconeogenesis from amino acids**
- Activation/Conversion of vitamin D from (D3) to 1,25-dihydroxycholecalciferol

Acute kidney injury (AKI)

Etiology

➤ **Pre-renal** due **decrease blood flow** such as:
low blood volume, low blood pressure , heart failure ,renal artery stenosis and renal vein thrombosis

➤ **Renal** most common causes:
-Glomerulonephritis, acute tubular necrosis, acute interstitial nephritis

➤ **Post-renal:** due **urinary tract obstruction**.
This may be related to benign prostatic hyperplasia, kidney stones, or an obstructed urinary catheter.

Pathogenesis

Due to the sudden drop in his blood pressure during the surgery, which seriously affected the blood flow to the kidneys leading to acute tubular necrosis.

Laboratory diagnosis

- **Increase serum creatinine**
- **Reduction in urine output (oliguria)**
- Ultrasound and kidney biopsy in unexplained AKI or associated with systemic diseases
- Measure the electrolytes

Complications

- Hyperkalemia (because of electrolyte imbalance)
- **Metabolic acidosis** (due to excessive accumulation of acidic substances in the blood due to diminished renal filtering functions)
- **Pulmonary edema** (build up of fluid)
- Permanent kidney damage. (end-stage renal disease)

Prognosis

Life threatening and can lead to the death

Treatment

- 1- Sodium Bicarbonate (in case of metabolic acidosis)
- 2- Diuretics
- 3- Anti-Hyperkalemic Drugs
- 4- Dialysis

Questions

1- what are the normal kidney functions?

- Fluid balance.
- Electrolyte control.
- Acid-base balance.
- Metabolism and excretion.
- Hormone production.

2- List some of the risk factors that lead to Acute Kidney Injury?

- Diabetes.
- High blood pressure.

- Advanced age.
- High blood pressure.
- Heart failure.
- Kidney diseases.

3-What are some of the abnormalities in function taking place in setting of Acute Kidney Injury?

- Decrease urine production.
- Elevated blood urea nitrogen and creatinine.

4-Depending of the symptoms and signs of this case what could be the Etiology of his AKI?

It is a Pre-renal cause of AKI.

5- Hypovolemic shock could be due to?

- Hemorrhage.
- Cutaneous losses (burns, Stevens-Johnson syndrome)
- Renal losses (Diuretics, polyuria)
- GI losses (vomiting, diarrhea)
- Pancreatitis.

6-When can a diagnosis of AKI be made?

-If there is rapid reduction in kidneys function. (Measured by serum creatinine).

Or

-Based on a rapid reduction in urine output. (Oliguria).

7-List some of the general symptoms which indicate that its an AKI?

- 1- Elevated serum creatinine (more than 0.3 mg/dl.)
- 2- Reduction in urine output (less than 0.5 ml/h.)

8-For identifying the underlying cause behind this AKI further testing is required which may include?

A renal Ultrasound and Biopsy.

9-In what case we should use these further tests?

- 1-Unexplained AKI.
- 2-AKI in the presence of nephritic syndrome.
- 3-Systemic disease associated with AKI.

10-What are the indications for the renal replacement therapy (hemodialysis)?

- 1-Symptoms of uremia (encephalopathy,...)
- 2-Uremic pericarditis.
- 3-Refractory volume overload.
- 4-Refractory hyperkalemia.
- 5-Refractory metabolic acidosis.

11-What are some of the complications of AKI?

- 1-Metabolic acidosis.
- 2-Hyperkalemia.
- 3-pulmonary edema.

12-How can these complications be treated?

By Sodium bicarbonate, Anti-hyperkalemic measures, and Diuretics.

13-Which one of the investigations that has been made for this case is the most important?

Urinalysis.

14-What changes did you suspect to see in the urinalysis of this case?

Protein and Granular casts.

15-Name a Diuretic agent that you could use in this case to control the fluid overload?

Furosemide

16-What kind of drugs should be used to improve his cardiac output and hence the renal perfusion?

Inotropes such as norepinephrine and Dobutamine.

17-which of the patient's medications you prefer to avoid?

Nephrotoxic medications such as non-steroidal anti-inflammatory drug (NSAID), *ibuprofen in this case*.

Thank you for choosing to study from
our work. Here's hoping it was to your
satisfaction!

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Best of luck,

The PBL team