15 ACID/BASE DISTURBANCES

أسئلة نظام جديد

1. **Enumerate causes of metabolic acidosis**

			A. HIGH Anion Gap Metabolic Acidosis	B. NORMAL Anion Gap Metabolic Acidosis
↑↑ Acids	↑↑ Production	Exogenous acids	5. Methanol, Ethylene glycol 6. Paraldehyde 7. NH4Cl 8. Salicylates	فاينال 58 ---
		Endogenou acids	3. Lactic acidosis 4. Ketoacidosis (DKA & Starvation)	---
	↓↓ Renal acid excretion		- Uremia (CKD)	3. Type 1 (Distal or Classic) RTA "Renal Tubular Acidosis" 4. Type 4 RTA
↓↓ HCO_3^-	Loss of bicarbonate		---	3. **From kidney** ▪ Type 2 (Proximal) RTA 4. **From GIT:** ▪ Diarrhea ▪ Tube drainage ▪ Ureteral diversion (e.g, ileal loop)

2. **A 58-year-old male presents to the nephrology clinic with complaints of fatigue, loss of appetite, and swelling in his legs for the past three months. He has a history of poorly controlled hypertension for 15 years and type 2 diabetes for 10 years. His blood pressure is 160/90 mmHg, body mass index is 32 kg/m2, and there is bilateral pitting edema. Serum creatinine is 4.2 mg/dL, eGFR is 20 mL/min/1.73 m2, serum sodium is 128 mEq/L, serum chloride is 100 mEq/L, and serum potassium is 6.5 mEq/L. Urine dipstick shows +3 proteinuria and no hematuria. His arterial blood gases: pH 7.28, bicarbonate 16 mEq/L, pCO2 32 mmHg.**

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A. What is his acid base disturbance?

- ↳ pH → ↓↓ → acidosis
- ↳ HCO3 → ↓↓
- ↳ CO2 → ↓↓ (hyperventilation to compensate the acidosis)

So??? Diagnosis →

metabolic acidosis with partial respiratory compensation

B. alculate anion gap?

- Anion Gap = Na - (Cl + HCO3)
- Na+ = 128 mEq/L
- Cl- = 100 mEq/L
- HCO3- = 16 mEq/L

Anion Gap = 128 (100+16) = 12 mEq/L

So??? → non high anion gap metabolic acidosis

C. What factors predict faster progression of chronic kidney disease in this patient??

- ↳ Look CKD Q

D. Enumerate 2 lines for management of hyperkalemia in this patient??

↳ Look K Dx

أسئلة اخرى

1. **Define acid-base disturbances?**
   - **Acid-base disturbances** are pathologic changes in **carbon dioxide partial pressure (Pco2)** or **serum bicarbonate (HCO3–)**.
   - These disturbances typically produce abnormal arterial pH values.
2. **List the clinical indications for performing an Arterial Blood Gas (ABG) test?**
   1. To assess the **adequacy of oxygenation and ventilation.**
   2. To evaluate any **severe illness** that may lead to **metabolic acidosis**, such as cardiac, liver, or renal failure.
   3. To assess patients in **hyperglycemic states** associated with **Diabetes Mellitus.**
   4. To monitor patients with **multiorgan failure, sepsis, or burns.**
   5. To assess **acid-base balance in critically ill patients.**
3. **State the normal reference values for arterial blood gases?**
   - The normal **pH** range is **7.35 to 7.45.**
   - The normal **PaCO2** range is **35 to 45 mmHg.**
   - The normal **HCO3** range is **22 to 26 mEq/L.**
4. **Define acidemia?**
   - **Acidemia** is defined as a **serum pH less than 7.35.**
5. **Define alkalemia?**
   - **Alkalemia** is defined as a **serum pH greater than 7.45.**
6. **Define acidosis?**
   - **Acidosis** refers to the **physiologic processes** that cause **acid accumulation** or **alkali loss.**
7. **Define alkalosis?**
   - **Alkalosis** refers to the **physiologic processes** that cause **alkali accumulation** or **acid loss.**
8. **List the six steps required for systematic ABG interpretation?**
   - The interpretation follows these steps:
     1. Assess the **validity of the ABG.**
     2. Determine if **acidemia or alkalemia** is present.
     3. Identify the **primary disorder** (respiratory or metabolic).
     4. Determine if the disorder is **compensated.**
     5. Identify if the disorder is **mixed or a pure primary** disturbance.
     6. Assess **oxygenation.**

9. Compare the primary acid-base disorders based on pH and the primary problem?

Disorder	pH Change	Primary Problem
Metabolic acidosis	Decreased (⇊)	Decreased (⇊) HCO_3^-
Metabolic alkalosis	Increased (⇈)	Increased (⇈) HCO_3^-
Respiratory acidosis	Decreased (⇊)	Increased (⇈) $PaCO_2$
Respiratory alkalosis	Increased (⇈)	Decreased (⇊) $PaCO_2$

10. Describe the compensation mechanism for metabolic disorders?

- Compensation for metabolic disorders occurs via the **lungs.**
- This change is reflected in the **$PaCO_2$** levels.
- **Respiratory compensation is immediate** following metabolic changes.

11. Describe the compensation mechanism for respiratory disorders?

- Compensation for respiratory disorders occurs via the **kidneys.**
- This change is reflected in the **HCO_3** levels.
- **Metabolic compensation is delayed,** with full compensation occurring after **48 hours.**

12. Compare the different levels of compensation based on pH and blood gas values?

Result of Compensation	pH Status	Other Value Status
Decompensated	Abnormal	Only one other value is abnormal
Partial compensation	Abnormal	All values (pH, HCO_3, $PaCO_2$) are abnormal
Full compensation	**Normal**	Both HCO_3 and $PaCO_2$ are abnormal

13. Define the anion gap (AG)?

- The **anion gap** is a value representing the difference between measured **positively charged ions (cations)** and **negatively charged ions (anions)** in the blood.
- It exists because blood tests do not measure all types of ions, and there are normally **more unmeasured anions than cations.**

14. List the causes of High Anion Gap Metabolic Acidosis (HAGMA)?

- Causes include:
  1. **Increased production of endogenous acid,** such as Lactate or Ketoacidosis.
  2. **Accumulation of endogenous acids** due to **Renal Failure.**
  3. **Toxins,** specifically:
     - Methanol
     - Ethylene Glycol
     - Salicylates.

15. List the causes of Normal Anion Gap Metabolic Acidosis (NAGMA)?

- Causes include:
  1. **Gastrointestinal (GI) loss of HCO_3**, such as through **Diarrhea.**
  2. **Renal loss of HCO_3**, such as **Renal Tubular Acidosis.**

16. List the causes of metabolic alkalosis?

- Causes include:
  1. **Loss of acid gastric secretions** through vomiting or nasogastric suction.
  2. **Primary mineralocorticoid excess,** typically accompanied by hypertension and hypokalemia.
  3. **Loop or thiazide diuretics,** which increase distal sodium delivery and enhance urinary hydrogen and potassium secretion.
  4. **Contraction alkalosis.**

17. Explain the mechanism of contraction alkalosis?

- It occurs when there is a **loss of relatively large volumes of fluid.**
- The **plasma bicarbonate concentration rises** because the extracellular volume contracts around a relatively constant quantity of bicarbonate.
- Additionally, the **stimulation of the RAAS** (Renin-Angiotensin-Aldosterone System) leads to **increased hydrogen excretion.**

18. Define hypoxemia and its parameters?

- **Hypoxemia** is defined as a **PaO_2 less than 80 mmHg** and/or an **SO_2 less than 92%.**