ABG session for POS
November 2018

8 Steps to ABG Interpretation

Step 1) Obtain ABG and lytes:

- If you don't perform the test, you'll never know what is going on with the patient

Step 2) Determine the primary process:

- Is it an acidosis or an alkalosis?
- Is the primary problem respiratory or metabolic?

Step 3) What is the compensation? Is there another process influencing the acid-base status?

- Look at the HCO3 and decide if it has changed by the expected amount
- If the change in HCO3 doesn't fit with the numbers on the table, there may be a second process

Primary Disorder	**Δ p_aCO_2**	**Δ HCO_3^-**
Acute Respiratory Acidosis	↑ 10	↑ 1
Acute Respiratory Alkalosis	↓ 10	↓ 2
Chronic Respiratory Acidosis	↑ 10	↑ 3
Chronic Respiratory Alkalosis	↓ 10	↓ 4
Metabolic Alkalosis	↑ 0.7	↑ 1
Metabolic Acidosis	↓ 1	↓ 1

Step 4) Determine the Anion Gap:

- This must be done even if it doesn't look like a metabolic acidosis

- Anion Gap = Na+ - [$HC0_3$- + Cl-] → normal < 12

- DDx of increased Anion Gap (MUDPILES)
  - Methanol, Uremia, DKA (or other ketoacidoses – starvation/etOH), Paraldehyde, INH/iron, Lactic acid, Ethylene Glycol, Salicylates
  - Real life DDx:
    - Lactic acidosis
    - Ketosis (DKA, starvation, alcohol)
    - Renal failure
    - Poisons (alcohols, ASA, cyanide)

Step 5) <u>If</u> an Anion Gap is present, is it the only process?

- Measure the ΔAG/Δ $HC0_3$- ratio
  - If the ratio = 1, then the AG is the only process
  - If the ratio ≠ 1, then there is another process
    - If ratio > 1, $HC0_3$- is too low, there is a concomitant non-AG acidosis
    - If ratio < 1, $HC0_3$- is too high, there is a concomitant alkalosis

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Step 6) Determine the Osmolar Gap

- Osmolar gap = measured osmolality – calculated osmolality → normal < 10

- Mesured Osm: given to you by the lab

- Calculated Osmolality = 2x[Na+] + glucose + urea
    - "2 salts and a sugar bun"

- DDx of increased Osmolar gap = ALCOHOLS
    - Methanol, Mannitol, Acetone, EtOH, isopropyl EtOH, Ethylene glycol, others
    - Combined AG and Osmolar gap = Methanol or Ethylene glycol

Step 7) Determine the A-a gradient

- A-a gradient
    - A-a gradient = $PA0_2$ (calculated) – $Pa0_2$ (measured)
    - Normal A-a gradient is < 10

- How do you calculate the $PA0_2$?
    - $PA0_2$ = (Pbar – PH20) x Fi02 – ($PaC0_2$ x 1.25)

- For patients <u>on room air</u> the formula can be simplified to:
    - A-a gradient = PA02 – Pa02
      = 150 – (PaC02 x 1.25) – Pa02

- For patients <u>on Oxygen</u>, you need to use the full formula:
    - A-a gradient = PA02 – Pa02
      = (Pbar – PH20) x Fi02 – ($PaC0_2$ x 1.25) – Pa02
      = (713 x Fi02) – (PaC02 x 1.25) – Pa02

Step 8) DDx of hypoxemia

- **Normal A-a gradient (<10)**
    - Low inspired O2 content (low FiO2 or low PiO2)
    - Hypoventilation

- **Increased A-a gradient (>10)**
    - V/Q mismatch
        - Asthma, COPD, Alveolar filling (fluid, blood, pus), pulmonary vascular disease
    - Shunt
        - Physiologic shunt
        - Intra-cardiac (ASD, PFO or VSD)
        - Intra-pulmonary
            - With normal capillaries: atelectasis or consolidation
            - With abnormal capillaries: p AVM's or intrapulmonary vasodilatation in HPS
    - Diffusion abnormality
        - Severe ILD, severe COPD, etc…