

Acid-Base Balance

Assumption

The student understands the basic physiology of acid-base regulation.

Goal

The student will be able to differentiate between the types of acid-base imbalances and how to apply this knowledge to clinical scenarios.

Objectives

By the end of the core surgical clerkship, the student will be able to:

1. List the values of pH, PaCO₂, PaO₂, and HCO₃ in a normal blood gas.
2. List the factors that affect oxygen delivery and consumption.
3. Indicate the mechanisms, methods of compensation, differential diagnosis, and treatment of the following acute acid-base disorders:
 - a. Metabolic acidosis
 - b. Respiratory acidosis
 - c. Metabolic alkalosis
 - d. Respiratory alkalosis

Problems

1. A 60-year-old 70 kg. male has a long-standing history of peptic ulcer disease. Two weeks ago, he began to vomit several times a day. The emesis often contained undigested food and was free of bile. The plain abdominal x-ray demonstrated a very distended stomach.
 - a. What type of acid-base disorder would you expect to find in this patient?
 - b. What electrolyte abnormalities would you expect to see in this patient?
 - c. Describe features of the physical examination that would fit in with the acid-base and electrolyte abnormalities.
 - d. Write orders for this patient to correct the abnormalities.
2. A 74-year-old male is intubated and in the SICU with intra-abdominal sepsis from perforated diverticulitis. His ABG is as follows: pH 7.21 PaCO₂ 50, PaO₂ 150mmHg, HCO₃ 18.
 - a. Describe the acid-base imbalance.
 - b. Propose treatment for the imbalance.

Skills

1. Conduct a focused physical examination looking for signs of dehydration, overload, electrolyte abnormality, acid-base abnormality.
2. Demonstrate the ability to:
 - a. Draw venous blood from an antecubital vein.
 - b. Interpret arterial blood gas results.

Teaching Hints

1. Have one student present a clinical problem where fluid and electrolyte abnormalities can be anticipated. Have half of the group describe the possible abnormalities while the other half describes the means of correction.

Acid-Base Balance (continued)

Teaching Hints (continued)

2. Introduce complicating features such as:
 - a. Fever, atelectasis, vomiting, and diarrhea, and have students describe how fluid and electrolyte requirements would change.
 - b. Have them describe the effects that these complications may have on acid-base balance.

Prevention

Discuss the causes of iatrogenic acid-base disorders.

Special Considerations

Discuss acid-base disorders as they are related to:

1. Toxic ingestions or drug overdose.
2. Electrolyte imbalance with pyloric stenosis in pediatric patients.