Acid - Base II

Acid Base Compensatory
Mechanisms
and
Predicting types of
Acid Base Abnormalities

K pp. 113-115
C pp 46-48

Objectives

Upon completion of this lecture the learner should be able to:

- Discuss the compensatory mechanisms for handling an excess of either a metabolic or a respiratory acid.
- Give typical clinical examples of compensatory mechanisms for a metabolic and respiratory acidoses and alkaloses.
- Discuss a system for rapid interpretation of acid-base / blood gas data .

Interpretation of A - B Data

Evaluation of acid-base / blood gas data values

- Complicated
  - tricks
  - nomograms
  - base excesses or deficits
  - "golden rules"
  - formulas (0.0017 x observed pCO_2 change)
- Simplified acid-base interpretation

Simplified Acid-base Interpretation

Start by using only one variable

- Look at only the patient's given pCO_2
  - Ask everything about that variable
    - is there a respiratory problem ?
    - what effect should this pCO_2 have on the pH?
  - Then ask : is this ***ONLY*** a respiratory problem ?
    - or is there also a metabolic component?

Simplified Acid-base Interpretation

Step 1

Start by looking at the patient's pCO_2 (only)

- Ask is there a respiratory problem ?
  yes or no ?
- If respiratory status is not normal (40) then ask is there a respiratory problem
  acidotic or alkalotic ?

Simplified Acid-base Interpretation

Step 2

After putting the pt. In a respiratory category
acidosis / normal / alkalosis

Then by looking only at the patient's pCO_2

- predict [by using a simple table] what effect this pCO_2 should have on the pH?

Effect of pCO_2 on pH

	respiratory acidosis	normal	respiratory alkalosis
pCO2	80	40	20
pH	7.2	7.4	7.6

Step Analysis of pCO_2 + pH

Step 3:

Ask if there is a mismatch between the CO2 and the expected pH.

- If no, then this is a straight respiratory problem
- If yes, then a ***metabolic component*** must be present to explain this mismatch
- In the examples that follow, patients will have a variety of acid-base abnormalities.
- In other patients, the mismatch is caused by a metabolic component .

Step Analysis of pCO_2 + pH

Step 3:

If there is a mismatch between the CO2 and the expected pH.

- Then this mismatch is caused by a metabolic component :
  - metabolic component will either worsen
  - or will improve the patient's respiratory condition.

Step Analysis of pCO_2 + pH

- step 1: look at the patient's pCO_2 and place the patient in a category:
  - a) respiratory acidosis, if CO_2 > 40 - 80
  - b) normal respirations, if CO_2 = 40
  - c) respiratory alkalosis, if CO_2 < 20 - 40
- step 2: based on this CO_2-category,
  - what pH should be expected ?
    - pick one: " ~7.2, ~7.4, or ~7.6 "
- step 3: ask if there is a perfect match between the CO_2 and the expected pH.

Case 1

pCO_2	80	40	20
pH	7.2	7.4	7.6

21 YOM with RR 38 and anxiety

pCO_2 : 21 Is there a resp. problem?

Expected pH: ____

Actual pH: 7.6 Is there a mismatch?

Case 2

pCO_2	80	40	20
pH	7.2	7.4	7.6

21 YOM with RR 38 and abd. pain, N,V

pCO_2 : 18 Is there a resp. problem?

Expected pH: ____

Actual pH: 7.1 Is there a mismatch?

Case 3

pCO_2	80	40	20
pH	7.2	7.4	7.6

21 YOF with RR 38 and fever

pCO_2 : 76 Is there a resp. problem?

Expected pH: ____

Actual pH: 7.23 Is there a mismatch?

Case 4

pCO_2	80	40	20
pH	7.2	7.4	7.6

71 YOF with RR 30 , cough , wheezing

pCO_2 : 79 Is there a resp. problem?

Expected pH: ____

Actual pH: 7.33 Is there a mismatch?

Case 5

pCO_2	80	40	20
pH	7.2	7.4	7.6

51 YOF with RR 26 , cough , am sputum

pCO_2 : 60 Is there a resp. problem?

Expected pH: ____

Actual pH: 7.39 Is there a mismatch?

Case 6

pCO_2	80	40	20
pH	7.2	7.4	7.6

51 YOF in full arrest, ALS is in progress

pCO_2 : 40 Is there a resp. problem?

Expected pH: ____

Actual pH: 7.62 Is there a mismatch?

Case 7

pCO_2	80	40	20
pH	7.2	7.4	7.6

51 YOF in full arrest, ALS is in progress

pCO_2 : 60 Is there a resp. problem?

Expected pH: ____

Actual pH: 7.12 Is there a mismatch?

Summary

We have discussed :

- Compensatory mechanisms for acidoses - metabolic and respiratory.
- Typical clinical examples of these
- A system for rapid interpretation of acid-base / blood gas data .