MECHANISMS OF HUMAN DISEASE
AND
PHARMACOLOGY & THERAPEUTICS

CASE-BASED SMALL GROUP DISCUSSION

MHD I
SESSION 11

Renal Block – Acid- Base Disorders

October 31, 2018

STUDENT COPY
**REMINDER: please allow the student assigned to develop a clinical question during the previous session to present their search strategy and findings.**

**Case #1**
Cc: I have had weeks of diarrhea

The patient is a 35 year-old women with AIDS brought to the emergency department with a chief complaint of diarrhea and dizziness. She has averaged 6-7 loose brown stools per day for the past several weeks. She denies having had blood in her stool or melena. She denies nausea or vomiting. Her appetite is poor. Her friend got worried when the patient fell in her apartment because she was “dizzy” and brought her to the ED

The patient is not currently on anti-retroviral therapy due to a history of noncompliance

On physical exam the patient is a well-developed, thin female in moderate distress. Vital signs (supine) blood pressure 100/60, pulse 100 and (standing) blood pressure 80/40, pulse 125, respirations 18 and she was febrile. HEENT exam was normal. Cardiac exam demonstrated an S1 and S2 without S3, S4 or murmur. Lungs were clear to auscultation and percussion. The abdomen was supple and minimally tender to palpation. Bowel sounds were hyperactive. Stool was guiac negative. Extremities were without cyanosis, clubbing or edema. Neurological exam was normal.

**Laboratory Data**

**BASIC METABOLIC PNL**
- Sodium: 136 [136-146] mmol/L
- Potassium: 3.4 [3.5-5.3] mmol/L
- Chloride: 112 [98-108] mmol/L
- Total CO2: 14 [23-27] mmol/L
- BUN: 42 [7-22] mg/dl
- Creatinine: 1.6 [0.7-1.4] mg/dl
- Glucose: 105 [70-100] mg/dl

**ARTERIAL BLD GAS**
- pH: 7.35 [7.36-7.46]
- pO2: 90 [74-108] mmhg
- HCO3: 14 [21-29] mm/l BE: 3 mm/l

**STUDY QUESTIONS**

1. Calculate the anion gap.

2. What is the primary acid-base abnormality?
3. What is the predicted compensatory response for this acid-based abnormality? Is this a simple or mixed disorder?

4. Formulate a differential diagnosis for conditions which may cause the acid-base disorder present in this patient. What is the etiology in this patient?

5. What are the physiologic mechanisms responsible for the generation of this disturbance?

6. What is your approach to managing this patient?
Case #2
Cc: “My husband has been sick for several days and he is worse today”

The patient is a 35 year-old man with a history of diabetes mellitus, type 1. For the past several days he has complained of malaise, nausea, anorexia, low grade fevers, and muscle aches. His 3 year old daughter stayed home from day care a few days ago because of fever and sore throat. The patient ate very little for dinner the evening before. His wife believes that he may have skipped his insulin the night before as well as this morning. His wife brought him to the emergency room stating that he has become increasingly lethargic. His medications include glargine insulin 16 units before bed and lispro insulin 6 units with meals.

He does not smoke and does not drink alcohol.

On physical exam the patient is a well-developed, thin male appearing his stated age. Blood pressure 101/62, pulse 102, respirations 28. He was afebrile. HEENT exam was remarkable for mild pharyngeal erythema without exudates. His mucous membranes were dry. Cardiac exam demonstrated an S1, S2 without S3, S4 or murmur. Pulmonary auscultation and percussion were within normal limits. There was mild diffuse tenderness on abdominal exam without rebound or guarding. Extremities were without abnormality.

Laboratory Data

<table>
<thead>
<tr>
<th>Basic Metabolic Panel</th>
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</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>142</td>
</tr>
<tr>
<td>Potassium</td>
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<tr>
<td>Chloride</td>
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</tr>
<tr>
<td>Total CO₂</td>
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</tr>
<tr>
<td>BUN</td>
<td>45</td>
</tr>
<tr>
<td>Creatinine</td>
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<tr>
<td>Glucose</td>
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<table>
<thead>
<tr>
<th>ARTERIAL BLD GAS</th>
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<tbody>
<tr>
<td>pH</td>
<td>7.30</td>
</tr>
<tr>
<td>pCO₂</td>
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</tr>
<tr>
<td>pO₂</td>
<td>108</td>
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<tr>
<td>HCO₃</td>
<td>10</td>
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Study Questions

1. Calculate the anion gap.
2. What is the primary acid-base abnormality?

3. What is the predicted compensatory mechanism and response for this acid-based disorder? Is this a simple or mixed disorder?

4. What is the relationship of the $\Delta$ bicarbonate and the $\Delta$ anion gap?

5. Formulate a differential diagnosis for the conditions which may cause the acid-base disturbance present in this patient.

Additional Laboratory Data

<table>
<thead>
<tr>
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<th>Value</th>
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<tbody>
<tr>
<td>Ketone Bodies</td>
<td>320 [NEG] mg/dl</td>
</tr>
<tr>
<td>b-Hydroxybutyrate</td>
<td>3.8 [0.0-0.3] mmol/l</td>
</tr>
</tbody>
</table>

6. What is the etiology of the acid-base disturbance in this patient. Support your answer. How does the above laboratory data help in determining the etiology?
7. What are the physiologic mechanisms responsible for the generation of this disturbance?

8. Discuss your approach to management of the acid-base disorder of this patient.

Cases 3,4,5,6,7 - Data will be provided during the small group session