Mechanisms of Human Disease and Pharmacology/Therapeutics

CASE-BASED SMALL GROUP DISCUSSION

Session 10

Renal block – Sodium Disorders

October 29, 2018
**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: 4 days of cough and worsening shortness of breath

An 85 year-old man presents to the emergency department with a 4 day history of cough productive of yellow-green sputum. He has felt progressively more short of breath. The cough has kept him from sleeping well for the past 2 nights. He has felt feverish and has had occasional chills. His appetite has remained normal. The patient’s daughter came to check up on him and encouraged him to come to the Emergency Department.

He has arthritis of both his knees which limits his mobility.

He takes a vitamin and acetaminophen 500mg twice daily.

The patient has been widowed for 3 years and lives alone. He has never smoked and drinks 1 glass of red wine with dinner.

On physical exam he is a well-developed, thin man in mild respiratory distress. Blood pressure (supine) 120/86, pulse 74, blood pressure (standing) 115/85, pulse 70, respirations 24. Temperature is 39°C. Bodyweight 60 kg; height 67 inches. Oxygen saturation on room air wi 87%. HEENT exam is unremarkable. Lungs exam demonstrated right lower lung field coarse breath sounds with egophony. There is dullness to percussion at the right lung base. Heart and abdominal exams are normal.

There is no peripheral edema. Dorsalis pedis and radial pulses are 2+.

Admission Laboratory Data

**BASIC METABOLIC PNL**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>120</td>
<td>[136-146] mmol/L</td>
</tr>
<tr>
<td>Potassium</td>
<td>3.9</td>
<td>[3.5-5.3] mmol/L</td>
</tr>
<tr>
<td>Chloride</td>
<td>89</td>
<td>[98-108] mmol/L</td>
</tr>
<tr>
<td>Total CO₂</td>
<td>24</td>
<td>[23-27] mmol/L</td>
</tr>
<tr>
<td>BUN</td>
<td>8</td>
<td>[7-22] mg/dl</td>
</tr>
<tr>
<td>Creatinine</td>
<td>0.8</td>
<td>[0.7-1.4] mg/dl</td>
</tr>
<tr>
<td>Glucose</td>
<td>90</td>
<td>[70-100] mg/dl</td>
</tr>
</tbody>
</table>

EXAM: CHEST AP

HISTORY: PATIENT WITH COUGH AND FEVER

FINDINGS:

THE CARDIAC SILHOUTTE IS SLIGHTLY PROMINENT.

THERE IS INCREASED DENSITY IN THE RIGHT LOWER LOBE WHICH IS CONSISTENT WITH INFILTRATE. THERE IS BLUNTING OF THE RIGHT COSTOPHRENIC ANGLE. THE LEFT LUNG IS FREE OF INFILTRATE OR EFFUSION.
Additional laboratory data

**Sodium, Rnd Urine**
Sodium mmol/L 60 mmol/L
Volume RANDOM ml

**Potassium, Random Urine**
Potassium, mmol/L 30 mmol/L
Total Volume RANDOM ml

**Osmolality, Urine**
500 [50-200] mmol/kg

**TSH**
2.00 [0.20-5.00] μu/ml

Education Objectives
1. Develop a problem list.

2. Calculate the serum osmolality in this patient.

3. Develop a differential diagnosis for hyponatremia in this patient.

4. What is the likely etiology of hyponatremia in this patient? What is the mechanism? Is the total body sodium in this patient normal, decreased, or increased?

5. Does this patient have symptoms of hyponatremia? Discuss your rationale.
6. What treatment(s) would you recommend to correct the hyponatremia in this patient?

7. What is pseudohyponatremia and what conditions cause it?

8. The third year medical student taking care of this patient remembers learning about a group of drugs called “vapatans” in the Pharmacology and Therapeutics course “Diuretic” lecture that are being selectively used for the treatment of this patient’s sodium abnormality. What do you recall?
Case #2
CC: “I am getting more and more swollen, it has been going on for a while”

A 60 year-old man with alcoholic cirrhosis presents because of worsening edema. His feet, legs, and “stomach” feel as is they are going to “explode”. He complains of shortness of breath. He has no other medical problems. He is unable to afford his medications. He lives with his sister and is currently abstinent from alcohol.

On physical exam the patient is a well-developed, poorly nourished, jaundiced man in mild distress. He is alert and oriented to person, place and situation. Blood pressure (supine) 110/75, pulse 100, (standing) 90/60, pulse 120, respirations 23. He is afebrile. Body weight 80 kg; height 69 inches. Cardiopulmonary exam is unremarkable. The abdomen is remarkable for tense ascites with caput medusa. Liver and spleen are not palpable due to the ascites. Lower extremities have 3+ pitting edema. Skin examination reveals spider telangiectasias of his upper chest. He has bilateral palmar erythema. On neurologic exam there is no asterixis.

Laboratory Data

<table>
<thead>
<tr>
<th>BASIC METABOLIC PNL</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>127</td>
<td>L 136-146 mmol/L</td>
</tr>
<tr>
<td>Potassium</td>
<td>3.6</td>
<td>3.5-5.3 mmol/L</td>
</tr>
<tr>
<td>Chloride</td>
<td>96</td>
<td>98-108 mmol/L</td>
</tr>
<tr>
<td>Total CO₂</td>
<td>23</td>
<td>23-27 mmol/L</td>
</tr>
<tr>
<td>BUN</td>
<td>35</td>
<td>H 7-22 mg/dl</td>
</tr>
<tr>
<td>Creatinine</td>
<td>1.8</td>
<td>H 0.7-1.4 mg/dl</td>
</tr>
<tr>
<td>Glucose</td>
<td>105</td>
<td>70-100 mg/dl</td>
</tr>
</tbody>
</table>

Sodium, Rnd Urine
Sodium mmol/l 6 mmol/l
Volume RANDOM ml

Osmolality, Urine
600 [50-200] mmol/kg

Educational Objectives
1. Develop a problem list.

2. Calculate the serum osmolality in this patient.
3. Formulate a differential diagnosis for hyponatremia in this patient.

4. What is the etiology of hyponatremia in this patient? Discuss the mechanism.

5. What treatment(s) would you recommend to correct the hyponatremia?

Case 3
Cc: per EMS – “patient found down in her home”
An 83 year old minimally responsive woman is brought to the emergency department via ambulance in July. The patient’s landlord became concerned when he noticed that her mailbox had not been emptied in several days and she was not answering her door. He called the police and 911. She was found lying on the floor between her bedroom and the bathroom. The apartment temperature was 87°F.

On physical exam she is a thin elderly woman. She is arousable only with noxious stimuli. Blood pressure 88/50, pulse 126, respirations 14, temperature 100.2°F. Oxygen saturation on 2 liters nasal cannula was 96%. There is no evidence of head trauma. Her pupils are equal and reactive. Her oral mucosa is extremely dry. Her lungs are clear to auscultation. Heart exam reveals tachycardia with normal S1, S2, no S3, no S4, no murmurs. Abdomen is scaphoid with normal bowel sounds. No masses are palpated. There is no edema of her extremities. Her skin is doughy. There are no areas of frank skin breakdown, however the lateral side of her left arm, abdomen, and leg appear dusky red.

**Laboratory Data**

**BASIC METABOLIC PANEL**

- **Sodium**: 180 H [136-146] mm/l
- **Potassium**: 3.3 [3.3-5.1] mm/l
- **Chloride**: 144 H [98-108] mm/l
- **CO2**: 31 [20-32] mm/l
- **Glucose**: 103 [70-100] mg/dl
- **Bun**: 66 H [7-22] mg/dl
- **Creatinine**: 1.5 [0.7-1.5] mg/dl
- **Calcium**: 9.1 [8.5-10.5] mg/dl
- **Osmolality**: 385 H [280-305] mosm/k

**CBC w/Diff**

- **WBC**: 4.6 [4.0-10.0] k/ul
- **RBC**: 4.02 [3.60-5.50] m/ul
- **Hgb**: 12.2 [12.0-16.0] gm/dl
- **Hct**: 37.7 [34.0-51.0] %
- **MCV**: 93.9 [85-95] fl
- **MCH**: 30.4 [28.0-32.0] pg
- **MCHC**: 32.4 [32.0-36.0] gm/dl
- **RDW**: 15.9 H [11.0-15.0] %
- **Plt Count**: 92 L [150-400] k/ul

**Plt Estimate DECR A [NORMAL]**

- **Gran**: 59 [45-70] %
- **Gran #**: 2.7 [2.0-7.0] k/mm3
- **Lymph**: 31 [20-45] %
- **Lymph #**: 1.4 [1.0-4.0] k/mm3
- **Mono**: 5 [0-10] %
- **Mono #**: 0.2 [0.0-1.0] k/mm3
- **Eo**: 4 [0-7] %
- **Eo #**: 0.2 [0.0-0.7] k/mm3
- **Baso**: 1 [0-2] %
- **Baso #**: 0.0 [0.0-0.2] k/mm3

RBC Morphology SEE BELOW
FEW/SLT POLYCHROMASIA

 UA w/Micro
 Color       STRAW A  [YELLOW]
 Clarity     CLOUDY A  [CLEAR]
 pH         5.0     [4.5-8.0]
 Spec Gravity >1.035  [1.003-1.035]
 Protein    NEG     [NEG]
 Blood      MOD A  [NEG]
 Glucose    NEG     [NEG]
 Ketones    NEG     [NEG]
 Bilirubin  NEG     [NEG]
 Urobilinogen  0.2   [0.2-1.0] eu/dl
 NITRATE    POS A  [NEG]
 LEUKOCYTES LARGE A  [NEG]
 RBC          10-20 A  [0-2] /hpf
 WBC          20-50 A  [0-5] /hpf
 Nonrenal Epith Cells  5-10 A  [0-5] /hpf
 Hyaline Casts   5-10  [0-2] /lpf
 Granular Casts  0-2 /lpf
 Bacteria    MOD

 Osmolality, Urine  815  [50-200] mmol/kg

Blood Culture - 2 sets
 Specimen Description -blood
 Special Requests -none
 Culture Results -Accessioned
 Report Status -Accessioned

Urine Culture
 Specimen Description -foley cath urine
 Special Requests -none
 Culture Results -Accessioned
 Report Status -Accessioned

EXAM: PORTABLE AP CHEST
HISTORY: ALTERED MENTAL STATUS.
FINDINGS: THE HILAR AND CARDIA MEDIASTINAL CONTOURS ARE WITHIN
NORMAL LIMITS. THE AORTA IS TORTUOUS. THE LUNGS ARE CLEAR. THERE
IS NO PNEUMOTHORAX, PLEURAL EFFUSION OR EDEMA.

Educational Objectives
1. Develop a differential diagnosis for hypernatremia.

2. What is the most likely etiology of hypernatremia in this patient?

3. Does this patient have signs and symptoms of hypernatremia? Discuss your rationale.

4. Discuss the approach to treating hypernatremia in this patient. Be specific with respect to the rate of correction of the hypernatremia. Why is this important?

5. What empiric antibiotics(s) should be started?

Case 4, Case 5 - Unknowns
Students will not have case data until the session

Reminder - **A student has been assigned to develop a clinical question during this session. Please allow time for the group to help formulate the question**

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