MECHANISMS OF HUMAN DISEASE
AND
PHARMACOLOGY & THERAPEUTICS

CASE-BASED SMALL GROUP DISCUSSION

MHD I
SESSION 2

Friday, September 11, 2015

STUDENT COPY
Case 1: “I probably have another UTI x 2 days”

History of Present Illness: A 37-year-old woman presents to the emergency department with fever for 2 days. She developed paraplegia from a gunshot wound 8 years ago and has required an indwelling bladder catheter since. Her appetite has been decreased for the past three days. She developed chills just as she arrived to the emergency department. She has had multiple urinary tract infections over the past 8 years with multiple hospitalizations and states “this is exactly how I feel when I get a bladder infection”

Additional chronic medical problems: none known

Medications:
- Baclofen 10mg tid
- Multivitamin daily
- Ibuprofen 400mg every 6 hours as needed for pain (pt rarely takes)
- Tap water rectal enemas 3x/week

Social history: The patient lives with her sister. She smokes ½ pack cigarettes per day for 10 years. She rarely drinks alcohol.

Review of Systems:
Pulmonary – no cough, no SOB
GI – no change in caliber or quantity of stool
GU – no vaginal discharge, LMP 1 week ago
ENT – no sore throat or runny nose
Skin – no decubitus ulcers
Musculoskeletal – she is able to independently transfer to and from her wheelchair

Physical Exam:
The patient appears fatigued
Temperature 102° F, Blood pressure 96/54, Pulse 110, Respiratory rate 16
Head and neck – no abnormal findings
Lungs – Clear to auscultation, normal percussion
Heart – S1S2 tachycardic, regular, no S3 or S4, no murmur
Abdomen - +BS, soft, nondistended, no tenderness elicited, no masses, no hepatosplenomegaly
Extremities - no peripheral edema, 2+ radial and DP pulses.
Skin – no decubitus ulcers, no rash

**Urinalysis**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>YELLOW</td>
<td>[YELLOW]</td>
</tr>
<tr>
<td>Clarity</td>
<td>CLOUDY</td>
<td>[CLEAR]</td>
</tr>
<tr>
<td>PH</td>
<td>8.7</td>
<td>[4.5 - 8.0]</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.030</td>
<td>[1.003 - 1.035]</td>
</tr>
<tr>
<td>Protein</td>
<td>NEG</td>
<td>[Negative]</td>
</tr>
<tr>
<td>Blood</td>
<td>POS</td>
<td>[Negative]</td>
</tr>
<tr>
<td>Glucose</td>
<td>NEG</td>
<td>[Negative]</td>
</tr>
<tr>
<td>Ketones</td>
<td>POS</td>
<td>[Negative]</td>
</tr>
<tr>
<td>Bilirubin</td>
<td>NEG</td>
<td>[Negative]</td>
</tr>
<tr>
<td>Urobilinogen</td>
<td>0.4</td>
<td>[0.2 - 1.0] eu/dl</td>
</tr>
<tr>
<td>Nitrite</td>
<td>POS</td>
<td>[Negative]</td>
</tr>
<tr>
<td>Leukocytes</td>
<td>POS</td>
<td>[Negative]</td>
</tr>
<tr>
<td>RBC</td>
<td>&gt;100</td>
<td>[0 - 2] /hpf</td>
</tr>
<tr>
<td>WBC</td>
<td>&gt;180</td>
<td>[0 - 5] /hpf</td>
</tr>
<tr>
<td>Bacteria</td>
<td>MANY</td>
<td></td>
</tr>
</tbody>
</table>

The patient is admitted to the hospital with a diagnosis of urinary tract infection. She is begun on intravenous fluids and antibiotics.

**Learning Objectives**

1. List bacteria which commonly cause urinary tract infections

On hospital day 2 the following results are reported:

**Urine Culture**

>100,000 colonies, Gram negative rod, non-lactose fermenter

**Blood Culture**

Gram negative rod, non-lactose fermenter
The bacteria have a swarming appearance on the agar plate (see Small Group Image – Bacteriology Set 5)

2. List the “lactose fermenting” and “non-lactose fermenting” Enterobacteriaceae. Why is knowing this clinically relevant?

3. Based on the given information, what is the most likely etiologic agent of this patient’s urinary tract infection? (complete the ”road map” as a review)

The medical team orders a renal ultrasound which shows the presence of a staghorn calculus in the right kidney

4. What is the link, if any, between this organism and the renal ultrasound finding?
CASE 2:
Cc: feeling terrible and getting worse x 2 weeks

A 25 year-old man is brought to the emergency department by his wife with a 2 week history of easy fatigability, dyspnea on exertion, easy bruising and bleeding gums. Over the last 24 hours, the patient developed a fever of 104° F, shaking chills, confusion and severe weakness. He could not get out of bed. The patient denies cough, sputum production, nausea, vomiting, stiff neck, dysuria, frequency of urination.

Patient has no significant past medical history and takes no medications. He has no drug allergies. He smoked 1 pack of cigarettes a day for two years then stopped. He does not drink alcohol. His parents, two sisters and one brother are alive and healthy.

PE: Patient appears pale, sleepy but arousable, oriented to person but not to time or place
VS: HR 120 weak, BP 70 palpable, R22, T 39.7° orally.
Mouth: bleeding gums
Lymph Nodes: enlarged non-tender cervical and axillary nodes (up to 1.5cm)
Neck: supple, full range of motion
Lungs: Clear to auscultation and percussion bilaterally
CV - S1. and S2 NL, no S3/ S4, SEM 3/6 at LLSB
Abd: soft non-tender, liver span 14 cm and tender, spleen tip felt
Ext: cool, clammy, purplish mottling
Skin: Scattered petechiae, black raised 1 cm lesion on left leg, no fluctuance or drainage of the lesion
Rectal: No external lesions, digital exam not done
Neuro: cranial nerves 2-12 intact, reflexes 2+ symmetrical, plantar reflexes downgoing

Heme Final  X42590
CBC w/ DIFF
WBC 1.0  L [4.0-10.0] k/ul
RBC 2.04  L [3.60-5.50] m/ul
Hgb 7.4  L [12.0-16.0] gm/dl
Hct 22.2  L [34.0-51.0] %
MCV 85 [85-95] fl
MCH 28.3 [28.0-32.0] pg
MCHC 33.3 [32.0-36.0] gm/dl
RDW 16.6 H [11.0-15.0] %
Plt Count 7 LL [150-400] k/ul
Diff Type Manual
Blasts % 20
Blasts 0.2
Gran 20 L [45-70] %
Gran # 0.2 L [2.0-7.0] k/mm3
Lymph 45 [20-45] %
Lymph # .45 [1.0-4.0] k/mm3
Mono 15 [0-10] %
Mono # 0.15 [0.0-1.0] k/mm3
Eo 0.0 [0-7] %
Eo # 0 [0.0-0.7] k/mm3
Baso 0 [0-2] %
Baso # 0.0 [0.0-0.2] k/mm3
*Slide review by pathologist performed

Urine Final - X1668

Urinalysis

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Reference Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>YELLOW</td>
<td>[YELLOW]</td>
</tr>
<tr>
<td>Clarity</td>
<td>CLEAR</td>
<td>[CLEAR]</td>
</tr>
<tr>
<td>PH</td>
<td>5.7</td>
<td>[4.5 - 8.0]</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.035</td>
<td>[1.003 - 1.035]</td>
</tr>
<tr>
<td>Protein</td>
<td>1+</td>
<td>[Negative]</td>
</tr>
<tr>
<td>Blood</td>
<td>Trace</td>
<td>[Negative]</td>
</tr>
<tr>
<td>Glucose</td>
<td>NEG</td>
<td>[Negative]</td>
</tr>
<tr>
<td>Ketones</td>
<td>Neg</td>
<td>[Negative]</td>
</tr>
<tr>
<td>Bilirubin</td>
<td>NEG</td>
<td>[Negative]</td>
</tr>
<tr>
<td>Urobilinogen</td>
<td>0.4</td>
<td>[0.2 - 1.0] eu/dl</td>
</tr>
<tr>
<td>NITRATE</td>
<td>NEG</td>
<td>[Negative]</td>
</tr>
<tr>
<td>LEUKOCYTES</td>
<td>NEG</td>
<td>[Negative]</td>
</tr>
<tr>
<td>RBC</td>
<td>2-5</td>
<td>[0 - 2] /hpf</td>
</tr>
<tr>
<td>WBC</td>
<td>0-2</td>
<td>[0 - 5] /hp</td>
</tr>
<tr>
<td>Nonrenal Epith Cells</td>
<td>0</td>
<td>[0 - 5] /hpf</td>
</tr>
<tr>
<td>Mucous</td>
<td>NEG</td>
<td>[Negative]</td>
</tr>
</tbody>
</table>

Micro - **Blood Culture** (Accessioned) - X63610

Micro - **Blood Culture** (Accessioned) - X62611

Micro – **Urine Culture** (Accessioned) - X62617

EXAM: DXCPAL - CHEST 2 VIEWS, FRONTAL (AP OR PA) AND LATERAL

EXAM: PA AND LATERAL CHEST

COMPARISON: NONE

HISTORY: FEVER

FINDINGS:
THE CARDIAC SILHOUETTE AND PULMONARY VASCULATURE ARE NORMAL. THERE IS NO FOCAL PARENCHYMAL ABNORMALITY, PLEURAL EFFUSION, PULMONARY EDEMA OR PNEUMOTHORAX.
*THIS EXAMINATION AND REPORT HAVE BEEN REVIEWED BY THE*
*ATTENDING RADIOLOGIST WHOSE NAME APPEARS ON THIS REPORT*

Despite aggressive intravenous fluid administration, it was initially difficult to maintain his systolic blood pressure >90 mm Hg. Broad spectrum intravenous antibiotics are begun. The patient was given blood products (packed red blood cells and platelets). A bone marrow biopsy was done and the diagnosis of acute lymphoblastic leukemia was made.
The next day blood cultures were growing a Gram negative non-lactose fermenting rod.

**Learning Objectives**
1. Develop a problem list.

2. The intensive care unit team contacts the Microbiology lab to learn more about the bacteria growing in the blood cultures to assure their empiric antibiotic therapy is appropriate. It is an aerobic, Gram negative, nonlactose fermenting, oxidase positive rod which produces pyocyanin pigment. What is the likely pathogen?

3. Why is this patient hypotensive? Summarize the pathogenesis.

4. In general terms, discuss the approach to antibiotic therapy for this pathogen.
5. What are the risk factors for infection with this organism in this patient? What are other risk factors for infection with this organism?

6. What is the “black raised 1 cm lesion” on the left leg of this patient? Describe the pathogenesis.

7. Review the Case Images

   Bacteriology Set 11

Questions 8 and 9 will be provided during the small group session. (the topics of these questions are related to the virulence factors and specific antibiotic management of this bacterial infection)

Case 3
Cc: Headache for 3 days

The patient is a 30-year-old woman who is a recipient of a renal transplant 3 years ago. She presents to the emergency department with complaints of headache and an inability to concentrate for the past several days. She has felt feverish but did not take her temperature. She has had mild intermittent nausea but no vomiting. She is more sensitive to bright lights than usual.
Her car has been undergoing repairs for the past 2 weeks so she had not left home much. She remembers her last trip out was to a Mexican restaurant where she had a burrito and soft cheese.

No one in her family is sick. She has not traveled outside of Chicago recently. She has no pets.

Her medications include cyclosporine, azathioprine, and prednisone.

On examination she had a temperature of 39°C, blood pressure 100/60, pulse 96, and respirations 18. She appeared anxious and fidgety.
Her lung and heart exams were normal. Her abdominal exam was unremarkable aside from her palpable, nontender transplanted kidney.

On full neurologic examination there were no motor or sensory abnormalities. Reflexes were normal.

There were no skin abnormalities.

Fundoscopic examination was normal with no evidence of papilledema.

A lumbar puncture is performed.

Chem Final

<table>
<thead>
<tr>
<th>Glu &amp; Protein, CSF</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose, CSF</td>
<td>30</td>
</tr>
<tr>
<td>Protein</td>
<td>90 [15-45] mg/dl</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spinal Fluid Cnt</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>2.0 ml</td>
</tr>
<tr>
<td>RBC</td>
<td>0 [0] /ul</td>
</tr>
<tr>
<td>WBC</td>
<td>112 [0-8] /ul</td>
</tr>
<tr>
<td>Seg</td>
<td>0%</td>
</tr>
<tr>
<td>Lymph</td>
<td>100%</td>
</tr>
</tbody>
</table>

**BASIC METABOLIC PNL**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>139 [136-146] mm/l</td>
</tr>
<tr>
<td>Potassium</td>
<td>4.0 [3.3-5.1] mm/l</td>
</tr>
<tr>
<td>Chloride</td>
<td>105 [98-108] mm/l</td>
</tr>
<tr>
<td>CO2</td>
<td>27 [20-32] mm/l</td>
</tr>
<tr>
<td>Glucose</td>
<td>109 [70-100] mg/dl</td>
</tr>
<tr>
<td>Bun</td>
<td>12 [7-22] mg/dl</td>
</tr>
<tr>
<td>Creatinine</td>
<td>1.4 [0.7-1.5] mg/dl</td>
</tr>
</tbody>
</table>

**Learning Objectives:**
1. Interpret the cerebrospinal fluid analysis. Develop a differential diagnosis for the abnormality.
Interpretation of CSF Analyses: Cerebrospinal Fluid Abnormalities in Various Central Nervous System Conditions
Complete the following table - it will be a helpful resource for MHD, USMLE and your clerkships
(it is acceptable to use up/down arrows to indicate elevated or decreased values for CSF glucose, protein, cell count and opening pressure)

<table>
<thead>
<tr>
<th>Condition</th>
<th>CSF Appearance</th>
<th>CSF Glucose (mg/dL)</th>
<th>CSF Protein (mg/dL)</th>
<th>CSF Cell Count (cells/mm³) and Cell Type</th>
<th>Opening Pressure (mm Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute bacterial meningitis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aseptic (viral) meningitis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hemorrhage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuberculous meningitis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fungal meningitis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CSF cultures, as well as 2 sets of blood cultures, grew colonies of non-spore forming Gram positive rods with small zones of beta-hemolysis. The colonies are catalase positive. Suspensions of the colonies demonstrate tumbling/umbrella motility at room temperature.

2. What organism do the cultures represent? (complete the “road map” as a review) What is your diagnosis? Do the CSF findings support your diagnosis?
3. Based on the history provided, how might the patient have acquired this infection?

4. What factors predisposed this patient to infection?

5. The recommended treatment for serious infections caused by this organism is ampicillin with gentamycin. This combination of drugs results in synergy – describe how/why.

6. To what group of antibiotics is this bacteria naturally resistant?
7. Review the Case Images: **Bacteriology Set 13**

---

**Case 4**

Cc: “Our baby has been sick for the past week with a cold and now has has 2 days of fever”

A 10-month-old male is brought to the pediatrician’s office with a 2 day history of fever to 102°F and of vomiting and irritability. He had been having cough and runny nose throughout the preceding week.

On physical examination the conjunctiva are normal. There is mild rhinorrhea. The pharynx is normal. Lung examination demonstrates clear breath sounds bilaterally. Abdominal exam is normal. The left tympanic membrane is slightly convex, translucent, and mobile. The right tympanic membrane is bulging, dull and opaque, with purulent fluid visible behind the membrane.

**Educational Objectives**

1. What is the diagnosis?

2. Viruses and bacteria both are etiologic agents of this disease process. Which bacteria are the most common causes of this infection?

**Questions 3-5 will be provided during the small group session and relate to antibiotic management of this disorder**