**February 2016 StuNews Case and Explained Answers**

*Case Reviewed by 2015 ACCP Exam Review Panel*

A 56-year-old man is brought to the emergency department by his wife after stepping on a nail that penetrated to the bone 3 days ago. He has been complaining of pain in his right foot for the past 3 days. Upon admission, his pain was rated as 9/10, and a 2-cm warm, moist, erythematous soft tissue wound was noted at the bottom of his right foot.

Past Medical History: Dyslipidemia; coronary artery bypass graft (CABG) x 2 vessels; hypothyroidism; atrial fibrillation; hypertension; diabetes

Social History: 1 beer/day; nonsmoker; no intravenous drug use; married with two children

Current Medications: Levothyroxine 150 mcg orally daily; aspirin 81 mg orally daily; lisinopril 20 mg orally daily; rivaroxaban 20 mg orally daily; metformin 1000 mg orally twice daily; insulin glargine 25 units subcutaneously daily

Allergies: Sulfa (hives), ibuprofen (severe upset stomach)

Vital Signs: Temperature 38.9°C; heart rate 111 beats/minute; Respiratory rate 21 breaths/minute; blood pressure 142/93 mm Hg; Weight 72 kg ; Height 190.5 cm

Lab Values: WBC 15.8 x 103/mL (15.8 x 109/L); differential WBC: 74% PMN, 7% bands, 12% lymphs, 2% monos. Hemoglobin 14.4 g/dL (144 g/L); platelets 123 x 103/L (123 x 109/L); hematocrit 43.4% (0.434); sodium 133 mmol/L; potassium 4.0 mmol/L; chloride 97 mmol/L; bicarbonate 22 mmol/L; glucose 235 mg/dL (12.9 mmol/L); calcium 9.5 mg/dL (2.38 mmol/L); BUN 21 mg/dL (7.5 mmol/L); serum creatinine 1.0 mg/dL (88.4 micromoles/L); phosphorus 2.9 mg/dL (0.94 mmol/L); magnesium 1.9 mEq/L (0.78 mmol/L); troponin < 0.2 ng/mL (0.2 micrograms/L); aPTT 31.3 sec; PT 12.3 seconds; INR 1.5; CRP 4.2 mg/dL (40 mmol/L)

Procedure Data: Radiography of injured right foot shows soft tissue and bone changes.

Physical exam: Pain on exertion with movement; lungs clear; CNS nerves intact

Other: Patient is unable/unwilling to bear weight on standing; tenderness, swelling, moist, erythematous, purulent 2-cm soft tissue wound on bottom of right foot

**Question 1**

Which signs/symptoms in this patient are consistent with infection?

1. Temp 38.9°C, phosphorus 2.9 mg/dL (0.94 mmol/L), CRP 4.2 mg/dL (40 mmol/L)
2. Differential WBC, radiograph imaging, serum creatinine 1.0 mg/dL (88.4 micromoles/L)
3. CRP 4.2 mg/dL (40 mmol/L), heart rate 111 beats/minute, WBC 15.8 x 103/mL (15.8 x 109/L)
4. Tender/swollen wound, troponin < 0.2 ng/mL, Hct 43.4% (0.434)

Answer: 3. CRP 4.2 mg/dL (40 mmol/L), heart rate 111 beats/minute, WBC 15.8 x 103/mL (15.8 x 109/L)

Rationale: All of the following indicate infection in this patient:

Temperature 38.9°C; heart rate 111 beats/minute; respiratory rate 21 breaths/minute; tender, swollen, purulent, warm, moist, erythematous 2-cm wound; CRP 4.2 mg/dL (40 mmol/L); WBC 15.8 x 103/mL (WBC 15.8 x 109/L); differential WBC: 74% PMN, 7% bands, 12% lymphs, 2% monos; radiography + for soft tissue and bone changes

A phosphorous level of 2.9 mg/dL (40 mmol/L) is not indicative of infection, making option 1 incorrect. The patient’s serum creatinine level is not indicative of infection, making option 2 incorrect. A troponin level of < 2.0 ng/mL (0.2 micrograms/L) and an Hct of 43.4% (0.434) are not indicative of infection, making option 4 incorrect.

Citation: Lew DP, Waldvogel FA. Osteomyelitis. Lancet 2004;364:369.

**Question 2**

Based on the subjective and objective findings, what type of infection does this patient most likely have?

1. Erysipelas
2. Gangrene
3. Impetigo
4. Osteomyelitis

Answer: 4. Osteomyelitis

Rationale: Osteomyelitis can occur as a result of the contiguous spread of infection to the bone from the adjacent soft tissues and joints, hematogenous seeding, or direct inoculation of infection into the bone as a result of trauma or surgery. Acute osteomyelitis typically presents with a gradual onset of symptoms over several days. Patients usually present with dull pain at the involved site, which may occur at rest or with movement. Local findings (tenderness, warmth, erythema, and swelling) and systemic symptoms (fever, rigors) may also be present. In this patient, the radiographic changes for soft tissue and bone are indicative of osteomyelitis. Erysipelas (large, raised red patches on the skin), gangrene (a type of necrosis caused by a critically insufficient blood supply) and impetigo (red raised sores mostly on the face) are not consistent with the patient’s presentation.

Citation: Cierny G III, Mader JT, Penninck JJ. A clinical staging system for adult osteomyelitis. Clin Orthop Relat Res 2003;7-24.

**Question 3**

Which organism is most likely responsible for the patient’s infection?

1. *Acinetobacter baumannii*
2. *Klebsiella oxytoca*
3. *Staphylococcus aureus*
4. *Streptococcus pneumoniae*

Answer: 3. *Staphylococcus aureus*

Rationale: Because this is a penetrating wound, *Staphylococcus aureus* would be the most common of the possible pathogens*.* Coagulase-negative staphylococci and aerobic gram-negative bacilli are also common organisms (although *Klebsiella oxytoca* would not be near the top of the list); other pathogens including streptococci (but not usually S*treptococcus pneumoniae*), enterococci, anaerobes, fungi, and mycobacteria have also been implicated. Examples are as follows: *Staphylococcus aureus, Streptococcus pyogenes, Staphylococcus epidermidis, Propionibacterium acnes,* and *Micrococcus*.

Citations:Lew DP, Waldvogel FA. Osteomyelitis. Lancet 2004;364:369.

Practice Guidelines for the Diagnosis and Management of Skin and Soft Tissue Infections: 2014 Update by the Infectious Diseases Society of America. fClinical Infectious Diseases 2014;1-43. Available at <http://www.idsociety.org/Guidelines/Patient_Care/IDSA_Practice_Guidelines/Infections_by_Organ_System/Skin___Soft_Tissue/Skin_and_Soft_Tissue_Infections/>. Accessed 8/21/15

**Question 4**

What empiric treatment is recommended for this patient?

1. Ciprofloxacin 750 mg orally twice per day PLUS vancomycin 15 mg/kg intravenously every 12 hours
2. Levofloxacin 750 mg orally daily PLUS cefepime 2 g intravenously every 8 hours
3. Vancomycin 15 mg/kg intravenously every 12 hours PLUS nafcillin 2 g intravenously every 6 hours
4. Vancomycin 15 mg/kg intravenously every 12 hours PLUS cefazolin 1 g intravenously every 8 hours

Answer: 1. Ciprofloxacin 750 mg orally twice per day PLUS vancomycin 15 mg/kg intravenously every 12 hours

Rationale: Vancomycin plus (any of the following that cover gram-negative organisms for empiric therapy for osteomyelitis): Ciprofloxacin 750 mg orally twice daily; Levofloxacin 750 mg orally daily; Ceftazidime 2 g intravenously every 8 hours; or Cefepime 2 g intravenously every 12 hours. Option 2 does not contain vancomycin and is therefore incorrect. Options 3 and 4 include nafcillin and cefazolin, respectively, neither of which is recommended in combination with vancomycin for the treatment of osteomyelitis, making both incorrect.

Citation: Lazzarini L, Lipsky BA, Mader JT. Antibiotic treatment of osteomyelitis: what have we learned from 30 years of clinical trials? Int J Infect Dis 2005;93:127.

**Question 5**

After 2 days on empiric antibiotics, blood cultures and sensitivity studies return and are as follows: *Pseudomonas aeruginosa*: sensitive to levofloxacin and ciprofloxacin; intermediate to cefepime and ceftazidime; resistant to piperacillin/tazobactam and meropenem. What treatment regimen is most appropriate based on the above culture and sensitivity results?

1. Cefepime plus levofloxacin x 8 weeks
2. Ceftazidime x 3 weeks
3. Levofloxacin x 6 weeks
4. Vancomycin plus ciprofloxacin x 4 weeks

Answer: 3. Levofloxacin x 6 weeks

Rationale: Given the sensitivities, levofloxacin or ciprofloxacin is the best choice (option 3 is correct). Combination therapy is not superior to monotherapy (options 1 and 4 are incorrect). Culture indicates intermediate sensitivity to ceftazidime, and this would not be preferred to levofloxacin (option 2 is incorrect).

Citation: Lazzarini L, Lipsky BA, Mader JT. Antibiotic treatment of osteomyelitis: what have we learned from 30 years of clinical trials? Int J Infect Dis 2005;9:127.