

CASE 9.2

Skin and Skin Structure Infections | Level 1

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1. What is the subjective and objective evidence that supports the diagnosis of cellulitis and requirement for hospitalization?

The diagnosis of cellulitis is based on the following clinical findings:

SUBJECTIVE FINDINGS: Increased leg erythema and swelling, fever per mother, and pain

OBJECTIVE FINDINGS: Fever (T_{\max} 39.5°C); slight hypotension (BP 105/68 mm Hg), leukocytosis (WBC $16 \times 10^3/\mu\text{L}$); elevated neutrophils (PMN 79.1%); left lower leg positive for erythema (nondemarcated), warmth, tenderness, induration, and edema (usually without suppuration or necrosis); and x-rays of femur, tibia, and fibula negative for soft tissue and bone involvement

The abrasion that the patient experienced 2 weeks ago may have introduced a bacterial inoculum to trigger the current cellulitis of his lower left leg. This patient presents with moderate-to-severe cellulitis that is accompanied by fever and leukocytosis with elevated neutrophils, which necessitate hospitalization for appropriate treatment.

2. Explain why the patient has cellulitis rather than erysipelas and necrotizing fasciitis by differentiating these types of skin and skin structure infections.

In contrast to cellulitis that affects the deep skin layers including the dermis and cutaneous tissue, *erysipelas* involves the epidermis and dermis. Erysipelas clinically manifests as intense erythema with sharply demarcated, palpable borders that may progress to bullae formation with severe necrosis.

Necrotizing fasciitis is a potentially life-threatening infection that affects the subcutaneous tissues. Although only mild swelling and erythema may be observed on the infected site, patients commonly report disproportionate pain. Systemic symptoms (e.g., oral or tympanic temperature of $\geq 38^\circ\text{C}$ or hypothermia, tachycardia, hypotension, confusion, leukocytosis) are common with necrotizing fasciitis, and patients may appear critically ill.

This patient has a nondemarcated skin infection marked by warmth, tenderness, and edema, and it is accompanied by systemic symptoms. There is no evidence of soft tissue involvement from the radiographic tests or report of disproportionate pain (scale 3/10). As such, the diagnosis of cellulitis supports this patient's clinical presentation.

3. What are the most likely pathogens causing cellulitis in this patient?

Most cases of cellulitis are caused by pathogenic bacterial skin colonizers, including *S. aureus* (methicillin-susceptible) and group A *Streptococcus* (also known as *S. pyogenes*). In cases of cellulitis complicated by abscess formation, community-associated methicillin-resistant *S. aureus* (CA-MRSA) should be strongly suspected. This patient has a serious cellulitis with notable fever, hypotension, and leukocytosis; hence, the pathogens suspected to cause infection are *S. aureus* (including CA-MRSA) and group A *Streptococcus*, which may have been introduced by the skin abrasion that the patient experienced 2 weeks ago.

4. Design an empiric antibiotic treatment regimen (including drug name, dose, frequency, and duration) that is appropriate for this patient.

Given the serious presentation of cellulitis with systemic symptoms (i.e., fever, slight hypotension, and leukocytosis), the patient should be hospitalized to receive parenteral antibiotic that adequately covers CA-MRSA at least empirically until culture and susceptibility data become available. The primary therapeutic goal is to cease the spread of, or reduce the redness, edema, and pain caused by the cellulitis within 48 to 72 hours after antibiotic initiation. Vancomycin 60 mg/kg/day IV (or 340 mg IV every 6 hours) is recommended empirically and should be adjusted based on therapeutic drug monitoring. If bone involvement, bacteremia, or other serious infections are definitively excluded, vancomycin dosing should be adjusted to meet an appropriate pharmacodynamic target to successfully treat cellulitis. If the patient is clinically stable, clindamycin 40 mg/kg/day (or 300 mg IV every 8 hours) is an alternative but should be used only if the local MRSA resistance rate is <10%. Clindamycin is a good option for transition to oral therapy for susceptible strains. Linezolid 30 mg/kg/day (or 230 mg every 8 hours) should be reserved for severe infections (e.g., septic shock) or when alternative antibiotics are contraindicated. Antibiotic therapy should be tailored toward culture and susceptibility data. The antibiotic

treatment duration for cellulitis cases requiring hospitalization is typically 10 to 14 days, depending on the patient's response. Improvement (or cessation of worsening) of clinical symptoms (e.g., fever, erythema) and laboratory abnormalities (i.e., WBC and PMNs) should be observed within 48 to 72 hours after antibiotic initiation. Transition to oral antibiotic therapy should occur when systemic symptoms resolve and significant clinical improvement at the site of the cellulitis is observed. In addition to antibiotic therapy, leg elevation and warm compresses 3 times daily will help the healing process. Topical antibiotic therapy is not indicated in this patient.

5. Identify, resolve, and provide parent education for the medication-related problem.

Based on gender and age, the patient is within the 5th percentile for weight and 80th percentile for height. The patient is experiencing loss of appetite and significant weight loss (~10 pounds) from the use of Adderall XR, which is a combination of the stimulants amphetamine and dextroamphetamine. The Adderall XR dose was increased 2 weeks ago to maximum dose of 30 mg per day. To minimize these significant adverse reactions, the Adderall XR dose may be decreased to the minimum effective dose as low as 10 mg per day (if possible). Notably, a heart murmur was reported on physical exam. Without any previous history of murmur, an echocardiogram should be performed to confirm a true murmur. All medications for ADHD possess a risk for cardiac effects, with the highest risk from stimulants. However, the stimulants are most effective for ADHD so a true murmur should be ruled out prior to considering other medications to treat ADHD.

The parents should be instructed to monitor and help improve the patient's appetite, diet, and weight. The patient should follow up with a healthcare professional to ensure achievement of weight gain, improvement of appetite, and for an echocardiogram to confirm a true heart murmur. If not improved, Adderall XR may need to be discontinued and another medication (e.g., clonidine or atomoxetine) may be initiated to manage his ADHD.