

CASE: A 28 year old man presents with increasing left wrist erythema and swelling. A 'pimple' developed at the site after he injected heroin three days prior. On exam, temperature is 38.4°C. The skin at the left wrist is tender and erythematous and wrist range of motion limited to 30 degrees. WBC is 15.5. What is the differential diagnosis? Which organisms most commonly cause cellulitis? How would you manage this case?

Skin and Soft Tissue Infections (SSTI)

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Clinical Findings: Cellulitis presents acutely as a focal area with swelling, warmth, and tenderness, sometimes with regional lymphadenopathy. An underlying abscess may be present particularly after injection drug use. Patients often have low grade fever, chills, and myalgias. Cellulitis often involves the extremities, but any skin surface can be affected.

- Risk factors for cellulitis are edema, open wounds, tinea pedis, psoriasis, obesity, venous insufficiency, poorly controlled diabetes, and injection drug use (IDU).
- Consider **necrotizing fasciitis** in toxic-appearing patients with severe pain and swelling, crepitance, blistered or necrotic skin, or conversely, minimal skin changes with numbness and significant pain. WBC is often > 20,000; Na⁺ may be low. Patient may have systemic signs of toxicity such as hypotension, acidosis, renal failure. Do not be fooled by a patient who uses IV drugs who “looks good”.
- Unlike cellulitis, which involves the subcutaneous tissue layer, **erysipelas** is a superficial infection often seen with psoriasis or eczema. Lesion borders are raised and sharply demarcated. Legs and feet are the site of infection in 85%. Erysipelas may be indistinguishable from cellulitis and treatment is the same.
- **Organisms.** B-hemolytic Streptococci groups A, B, C, and G are responsible for most; Strep lesions often have well-defined borders and tend to be bright and erythematous. *Staphylococcus aureus* is also a common pathogen; borders are usually diffuse and ill-defined. Less common skin infections include *Pseudomonas aeruginosa*, in puncture wounds to the foot; in water exposure and trauma, *Vibrio vulnificus* and *Aeromonas hydrophilia* (often with diarrhea); and *Erysipelothrix* and *Pasteurella* in animal bites. Cellulitis in diabetic foot ulcers is often polymicrobial, with aerobic gram negative bacilli and anaerobes, plus the usual organisms.

Differential Diagnosis: Venous thrombosis, ruptured Baker’s cyst, gout, erythema nodosum, septic arthritis, osteomyelitis, and post-radiation dermatitis.

Diagnosis: Cellulitis is a clinical diagnosis. Acutely red, warm, swollen, painful skin with fever and elevated WBC suggest the diagnosis. Tests to identify the responsible microbe are low yield as cellulitis often has a low bacterial burden. Blood cultures turn positive in ~2%. Cultures are appropriate in patients with systemic toxicity, therapeutic non-response, unusual exposures like bites or water exposure, and recurrent infection. Ultrasound can locate and define abscesses.

- **Orbital cellulitis:** Distinguish between preseptal and orbital involvement; if patient has limited extraocular movements, proptosis, or visual changes, obtain CT to rule out orbital inflammation; consult ophthalmology if positive findings.
- **Hand cellulitis:** Common abscess sites are fingernails (paronychia) and digital pulp space (felon); these should be incised and drained. Check for flexor tendon involvement – digit held in partial flexion, excessive tenderness along flexor tendon sheath, pain with passive digit extension. Consult surgeons if you find any loss of hand function. X-ray to rule out air or foreign body. Elevate and immobilize affected arm.

- Deep infections. Facial cellulitis can overlie sinus or dental infection; cellulitis near a joint may mean osteomyelitis or septic arthritis; perirectal cellulitis may overlie perirectal abscess.

Management Principles

- Use intravenous agents initially in hospitalized patients with systemic symptoms, switch to oral when the patient shows clinical improvement.
- Choose antibiotics based on risk factors. In patients without risk factors for Methicillin Resistant Staphylococcus Aureus (MRSA) cellulitis usually responds to IV nafcillin or a 1st generation cephalosporin like IV cefazolin; Clindamycin if penicillin allergic. Treat for 7-14 days depending on severity of symptoms. An abscess that has been incised and drained may not need antibiotic treatment unless there is surrounding cellulitis. Ask about prior treatment and antibiotics in the past 4 weeks as this may indicate incomplete therapy or suggest anti-microbial resistance.
- If prior history of MRSA, MRSA risks, history of injection drug use, see below.
- Mark infection borders. Cellulitis lesions may spread beyond initial boundaries even though coverage is appropriate.
- Lymphangitic spread is concerning, particularly after several days of therapy.
- Consider abscess. Evaluate skin daily for fluctuant mass. If patient is not improving, has recurrent fevers or rising WBC count, ultrasound for occult abscess. Abscesses should be incised and drained – involve surgeons early. Send fluid for gram stain and culture.
- Cellulitis recurs in 20-50% of patients. In patients with recurrent disease, use protective dressings over edematous sites and treat tinea pedis, psoriasis, or other primary wound.

Associated deep infections. In suspected *Aeromonas* infections, use a fluoroquinolone; in facial cellulitis with underlying sinusitis or otitis, use a 2nd or 3rd generation cephalosporin to cover *Haemophilus influenzae*; in diabetic foot ulcer cellulitis, use broad spectrum agents like ampicillin/sulbactam. Levofloxacin or Clindamycin if penicillin allergic.

Injection drug users and MRSA: Patients who ‘skin pop’ or ‘muscle’ their drugs are at high risk of infection. Abscess is more common than cellulitis and patients often self-treat by lancing and with antibiotics obtained on the street.

MRSA prevalence is rising in the U.S., particularly among the urban poor in institutions, IDUs, and prisoners: National Nosocomial Infection Survey data indicate 50% of ICU and 40% of non-ICU hospital isolates were MRSA. At Harborview Medical Center in 2005, 80% of *Staphylococcus aureus* isolates were methicillin-resistant. Vancomycin is appropriate empirically in hospitalized patients with MRSA risk factors plus systemic symptoms. At Harborview, 90% of MRSA is sensitive to trimethoprim-sulfamethoxazole (TMP-SMX), which is effective in soft tissue infections and a good alternative for patients without systemic findings. Best regimen is probably 2 tabs oral bid for 7-14 days. Oral tetracyclines are effective in 92%. 70% of Harborview isolates are Clindamycin-resistant; resistance can be induced during a course of treatment.

Linezolid is highly effective but costs \$96/day versus \$0.20/day for TMP-SMX and routinely causes thrombocytopenia. Save Linezolid for patients unable to take alternatives. Some data suggest that nasal swab cultures may help identify antimicrobial susceptibilities.

Case Follow-up: The patient was hospitalized with cellulitis. And as he was high risk for MRSA, he received IV vancomycin. Fevers and swelling persisted after three days of antibiotic therapy. An ultrasound revealed underlying abscess, that was drained surgically. The patient’s symptoms resolved soon after abscess drainage and since he had surrounding cellulitis was discharged with 7 days of TMP-DMX.

Clinical Pearls

- Consider necrotizing fasciitis on admission in all patients with cellulitis especially if any signs of systemic toxicity. Involve the surgeons immediately if you suspect necrotizing fasciitis.

- Ask about prior treatment or self-treatment with antibiotics to identify incomplete course of therapy. Evaluate each situation individually for the possibility of resistance.
- Consider imaging for abscess if no improvement or worsening in the first 24-48 hours.
- Empiric treatment for MRSA is appropriate if risk factors.

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