Getting a Feel For
Skin Infections

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Bacterial infections of the skin and underlying soft tissues are among the most common complaints encountered in the emergency department and in acute ambulatory care settings.[1,2] Although most patients with skin and soft tissue infections (SSTIs) can be managed effectively as outpatients, some, especially those with associated comorbidities, may have to be admitted to hospital. Some SSTIs can lead to significant morbidity and, occasionally, mortality. SSTIs can range from mild pyodermas to necrotizing infections (Figure 2). The diagnosis of most SSTIs is made clinically (Table 1).

Carol's case

Carol, a 40-year-old obese woman, presents with a one-day history of redness, swelling, and mild pain in her left lower leg (Figure 1). She has had no prior history of similar symptoms. She reports some chills, but has not measured her temperature.

She does not take any regular medications, and reports a history of rash with penicillin.

Physical examination reveals that she weighs 290 pounds (96.6 kg) and is afebrile, with normal heart rate and blood pressure. She has marked erythema of the left lower leg with no lymphangitis, and minimal pain on palpation of the erythematous area.

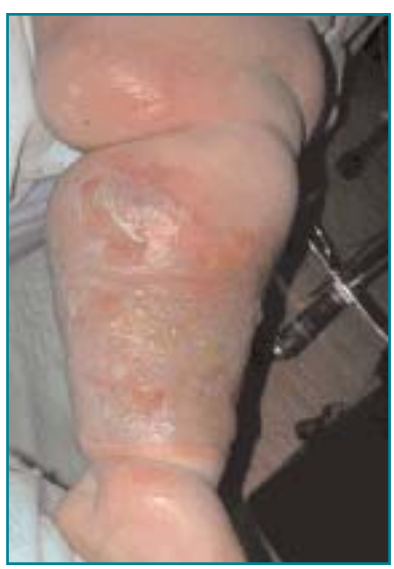

Figure 1. Cellulitis of the lower extremity in an obese woman.

For a Q&A on Carol's case, see page 90.

What is impetigo?

Impetigo is a superficial, intraepidermal infection. Although it is most commonly seen in children aged two to five, it can occur at any age and is highly contagious. Impetigo is classically caused by *Streptococcus pyogenes* (*S. pyogenes*), however, *Staphylococcus aureus* (*S. aureus*) has been identified as the sole pathogen in recent years. Epidemics of impetigo may occur in settings of

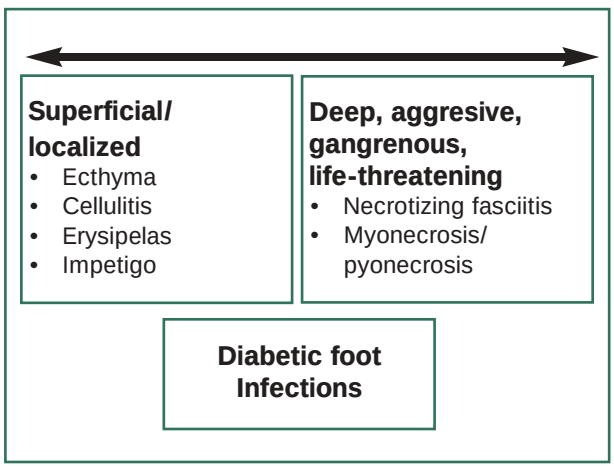

Figure 2. Clinical spectrum of skin and soft tissue infections.

poor hygiene and, particularly, in children of lower socioeconomic status. The condition occurs most commonly during hot, humid weather conditions.

Typically, the infection originates as small papules, which gradually form pustules and vesicles. The vesicles rupture and leave a characteristic honey-coloured scaling over an inflammatory base. The infection usually presents on the face, but may also occur at the site of minor trauma.

For many patients, topical treatment with mupirocin, 2%, applied three times daily, and good hygiene may be adequate. If oral therapy fails, an oral antistaphylococcal agent is appropriate.

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Table 1

What to look for when diagnosing SSTIs

- Appearance of the skin lesion
- Chronology of the process
- Knowledge of the patient's age
- Knowledge of comorbid illnesses
- Evidence of systemic signs of disease
- History of trauma or surgery
- History of bite from insects, animals, or humans

What is erysipelas?

Erysipelas is a distinctive type of superficial cellulitis of the skin (Figure 3). It is characterized by a rapidly progressive, erythematous, indurated, painful, and sharply demarcated area of skin infection caused by *S. pyogenes*.

The initial site of entry is not usually obvious, but it is more common in the very young or the elderly. About 70% to 80% of lesions occur on the lower extremities, and 5% to 20% on the face. Systemic symptoms, such as chills, fever, rigours, and sweats are frequent. Predisposing factors include venous stasis, diabetes mellitus, alcoholism, and chronic lymphatic obstruction. About one-third of cases are recurrent.

Initial treatment consists of oral penicillin, with oral erythromycin as a suitable alternative in patients who are allergic to penicillin. Three to four days of antibiotic therapy is usually required before signs and symptoms of erysipelas resolve. If the condition fails to improve, the administration of parenteral antibiotics is required.

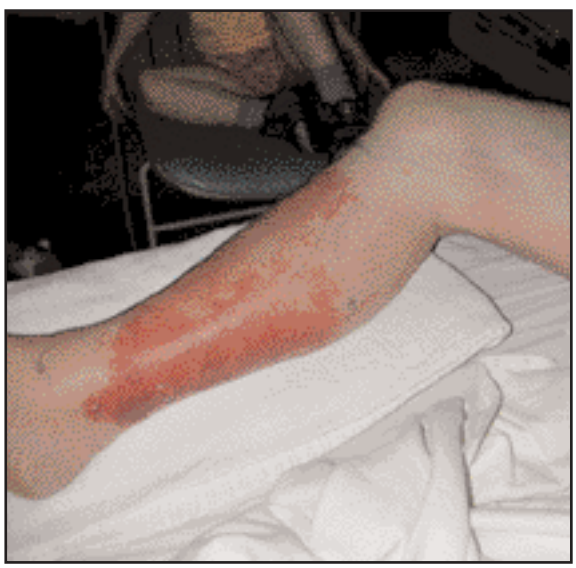

Figure 3. Erysipelas of the lower extremity.

What is cellulitis?

Cellulitis is a deep skin infection which involves the dermis layer. It commonly begins as a hot, red, edematous eruption which may progress to lymphangitis, with regional lymphadenopathy. Fever, chills, rigours, and sweats are frequent. In contrast to erysipelas, the borders of an area of cellulitis are not sharply demarcated. Cellulitis commonly begins at the site of antecedent trauma. Rarely, it may develop from the blood-borne spread of infection to the skin and subcutaneous tissues. The most common etiologic organisms are *S. aureus* and *S. pyogenes*.

The diagnosis is a clinical one, as the diagnostic yield of cultures, aspirates, and blood cultures is low. Positive cultures can be obtained from 30% of closed lesions by use of a fine-needle aspiration technique, but this should be reserved for patients in whom an unusual pathogen is suspected.

Q&A on Carol's case

1. Which antibiotic would be most appropriate to treat Carol with at first?

   As the patient shows no signs of advanced infection at first, it is reasonable to try empiric oral antibiotics. Although Carol reports a history of allergy to penicillin, an oral, first-generation cephalosporin may be used safely.

2. What is the most likely diagnosis after her symptoms worsen?

   The clinical picture is still consistent with a diagnosis of cellulitis. Necrotizing fasciitis is unlikely given the minimal pain.

3. How should the patient be managed at this point?

   The most likely reason the patient did not respond to the prescribed antibiotics is inadequate dosing. In order to achieve adequate levels of antibiotics, she would best be managed with parenteral antibiotics.

4. What antibiotic(s) would be used if the patient had diabetes?

   A first-generation cephalosporin would still be the most appropriate antibiotic. However, if the patient had an infected wound or an infected diabetic foot ulcer, broader spectrum antibiotics would be required.

Initial care of cellulitis should include elevation of the involved limb to reduce swelling. Treatment of cellulitis involves administration of an oral antibiotic with antistaphylococcal activity, such as cloxacillin or cephalexin. Patients who fail to respond to oral antibiotics, or who are immunocompromised should be placed on intravenous antibiotics and assessed for the possibility of deeper necrotizing infection.

What is necrotizing fasciitis?

One type of necrotizing fasciitis, caused by a virulent strain of *S. pyogenes*, is an uncommon, severe infection involving the subcutaneous soft tissues. It is usually an acute process and most commonly affects the extremities, particularly the legs. Other sites of predilection are the abdominal wall, perianal and groin areas, and post-operative wounds.

The affected area is initially erythematous, swollen, without sharp margins, hot, shiny, and intensely painful and tender. Lymphangitis and lymphadenitis are infrequent. The process progresses rapidly over several days, with sequential skin colour changes from red-purple to patches of blue-gray. Within three to five days, skin breakdown with bullae and cutaneous gangrene occurs. By this stage, the area is no longer painful. The development of anesthesia may precede the appearance of skin gangrene, and may provide a clue that the process is necrotizing fasciitis and not a simple cellulitis. Systemic toxicity is also prominent, with fever, tachycardia, and hypotension. The presence of marked systemic toxicity and/or pain disproportionate to the clinical findings should raise the suspicion of necrotizing fasciitis.

Prompt diagnosis is of paramount importance because of the rapidity with which the process can progress. The overall mortality rate is 20% to 47%; this is reduced to 12% if the diagnosis is made within four days of appearance of initial symptoms.[3] The presence of subcutaneous gas on X-ray is not characteristic of necrotizing fasciitis

due to *S. pyogenes*. Computed tomography or magnetic resonance imaging may demonstrate the presence of subcutaneous and fascial edema (with or without the presence of subcutaneous gas) and help to distinguish the process from cellulitis. However, patients in whom the diagnosis of necrotizing fasciitis is strongly considered should undergo urgent surgical exploration and debridement if deep infection is found.

Initial parenteral antibiotics should include the combination of penicillin and clindamycin. Intravenous immune globulin may also be beneficial.

What are diabetic foot infections?

Chronic foot infections in patients with diabetes mellitus are common and difficult problems. They often begin after minor trauma in patients with peripheral neuropathy, neuropathic ulcers, and/or peripheral vascular insufficiency.

Diabetic foot infections may be divided into two categories:

1. ***Non-limb threatening infections:***
   - Superficial
   - Lack systemic toxicity
   - Minimal cellulitis extending < 2 cm from site of entry
   - Ulceration does not extend through the skin; lack of significant ischemia
2. ***Limb-threatening infections:***
   - More extensive cellulitis
   - Lymphangitis
   - Ulcers penetrating the skin into subcutaneous tissues
   - Prominent ischemia

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Take-home message

What should I look for?

- Skin infections present in a variety of ways. It is most important to look at the appearance of the lesion, to get a good history from the patient, and to look for any evidence of serious disease.

What is the treatment?

- Treatment varies depending on presentation, but mainly involves antibiotics.
- If there is suspicion of necrotizing fasciitis, patients should undergo urgent surgical exploration and debridement.

The second category is often polymicrobial and is an indication for immediate hospitalization with parenteral antibiotics and surgical exploration/debridement.

Almost all open wounds will become colonized with various micro-organisms, but uninfected lesions do not require antibiotic therapy. The presence of purulent secretions, and two or more of the classic symptoms of inflammation, usually indicate infection. Oral cephalexin or clindamycin treatment for two weeks is usually adequate. The antibiotic spectrum should be broadened to include coverage for aerobic gram negative bacilli, and anaerobic bacteria for more severe infections. Superficial ulcers complicated by cellulitis usually warrant the administration of parenteral antibiotics. Dx

References
1. Deery HG: Outpatient parenteral anti-infective therapy for skin and soft tissue infections. Infect Dis Clin North Am 1998; 12(4):935-49.
2. Nichols RL, Florman S: Clinical presentations of soft-tissue infections and surgical site infections. Clin Infect Dis 2001; 33(Suppl 2):S84-93.
3. Swartz M: Skin and Soft Tissue Infections. In Mandell GL, Bennett JE, Dolin (eds.): *Principles and Practice of Infectious Diseases*. Fifth edition. Churchill Livingstone, Philadelphia, 2000.

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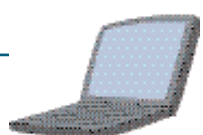

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