

SOFT TISSUE INFECTIONS

Soft tissue infections can be difficult to treat. All health care providers, especially those practicing in rural settings, must be able to differentiate between infections that need treatment with antibiotics alone and infections that require incision and drainage or more radical debridement. Serious consequences can result when a severe infection requiring operative management is misdiagnosed as a minor infection.

Cellulitis vs. Abscess

Cellulitis is a diffuse infection of the soft tissues with no localized area of pus amenable to drainage. The affected area is described as indurated (i.e., warm, red, and swollen). It is also painful. A component of lymphangitis (infection involving the lymphatics) is indicated by red streaking, progressing proximally from the affected area.

An **abscess** is a localized collection of pus, often with a component of surrounding cellulitis (with the above signs). One sign of an abscess is an area of fluctuance; that is, when you apply gentle digital pressure over the area, you can push and feel a “give,” indicating the presence of fluid underneath. Another sign is that an abscess often seems to “point;” that is, the skin starts to thin from the pressure of the fluid underneath.

The distinction between cellulitis and abscess is important. The main treatment for an abscess is incision and drainage (cutting into the abscess and widely opening the abscess cavity). Cellulitis does not warrant this intervention.

Gangrene

The term *gangrene* is used to describe tissues that are dead. There are two subtypes of gangrene: dry and wet. The distinction is important.

Dry gangrene describes tissues that are generally black and dried out, with a distinct border between dead tissue and surrounding healthy tissue. Sometimes dry gangrenous tissues fall off on their own (dry gangrenous toes can fall off with minimal manipulation). However,

debridement is usually required, but it is not emergent. Dry gangrene usually places the patient at no health risk as long as it does not become infected (see below).

In contrast to dry gangrene, **wet gangrene** can be a significant health risk. It connotes active infection (noted by pain, swelling, redness, and drainage of pus) in the tissues surrounding the obviously dead tissue. Urgent debridement is required to prevent further tissue loss and worsening soft tissue infection.

Necrotizing Fasciitis

Necrotizing fasciitis is a serious, life-threatening infection of the fascia (the thin connective tissue overlying the muscle and under the skin and subcutaneous tissue). The popular press calls it the disease of “flesh-eating bacteria.”

Necrotizing fasciitis is not common, but it must be considered in evaluating a patient with a soft tissue infection that seems to be progressing rapidly to surrounding tissues. This diagnosis should be considered when the patient is “sicker” than you would expect for simple cellulitis.

The skin is swollen but often without many signs of cellulitis. The skin simply does not look “right.” You may be able to feel subcutaneous air in the soft tissues, or you may see air in the soft tissues on x-ray (no air is present in normal soft tissues on x-ray).

The patient is often quite ill, with high fever, low blood pressure, general weakness, or even shock, and the infection spreads quickly. Radical debridement and even amputation may be necessary to save the patient’s life.

Treatment requires aggressive operative debridement (opening the soft tissue spaces, as with an abscess) to remove affected tissue, intravenous antibiotics, close monitoring of the patient, and aggressive treatment of septicemia. Hyperbaric oxygen also may be indicated but does not replace aggressive operative treatment. Patients with necrotizing fasciitis should be treated by a surgeon with critical care expertise.

Evaluation of Patients with Soft Tissue Infection

History

Antecedent Trauma

Ask about traumatic injury to the area before the signs of infection developed.

Cuts from glass and punctures from metal objects should raise concern about the presence of a foreign body in the soft tissues.

History of an animal bite should raise concern about specific bacterial organisms that may require a particular antibiotic (see discussion of specific treatments below).

Medical Issues

Infections in patients with diabetes are often worse than you expect, and more difficult to treat. You must treat these infections aggressively, and be sure to control the patient's blood sugar.

Ask about the patient's tetanus immunization status, and give a booster as indicated.

Physical Examination

The classic signs of infection are redness, warmth, swelling, and pain.

Look closely for puncture wounds or other signs of trauma.

Try to distinguish between a localized collection of pus that needs drainage and diffuse infection. Check for fluctuance, as previously described.

Determine whether the induration is spreading to surrounding areas. Do red streaks extend proximally from the affected area?

Feel for crepitus (subcutaneous air) in the soft tissues, which is a sign of necrotizing fasciitis. Press on the soft tissues. If air is present under the skin, it will feel as if you are pressing on crinkled layers of cellophane or popping air bubbles beneath the skin.

Assess the patient for fever, chills, low blood pressure, generalized weakness, and malaise.

Check for enlarged lymph nodes in the surrounding area (groin or armpit, as appropriate).

Determine whether a fluctuant area is present over a pulse point (e.g., in the groin over the femoral artery or on the volar aspect of the elbow over the brachial artery).

Additional Studies

Additional studies for all patients should include a complete blood count with a white blood cell count and X-ray evaluation of the infected area.

If the infectious process overlies a pulse point, the underlying artery may be involved, resulting in a **pseudoaneurysm** (an outpouching of the artery). Before any surgical intervention, you must evaluate the vessel with an ultrasound/ duplex scan.

If a pseudoaneurysm is present, a surgeon with vascular expertise must be involved in the patient's care. If you incise and drain the abscess without proper equipment and expertise, you will open the blood vessel, which may result in massive blood loss and death of the patient.

What to Look for on the X-ray

- Foreign bodies
- Unsuspected fractures/ dislocations
- Underlying bone infection (bone edges appear irregular because bone has been destroyed by infection)
- Air in the soft tissues (when previous incision and drainage have not been done), which strongly indicates necrotizing fasciitis. Localized air may be present in the soft tissues in the immediate vicinity of an incision and drainage site, but diffuse air in the tissues is a sign of a necrotizing infection.

General Treatment

The patient must be evaluated carefully to distinguish among simple cellulitis, an abscess in need of incision and drainage (I & D), or necrotizing fasciitis in need of emergent radical debridement.

If the patient is stable with normal blood pressure and has no fluctuance, the probable diagnosis is cellulitis. Treatment with antibiotics and warm compresses is indicated. Watch for signs of progression, which may indicate an underlying abscess or need for a change in antibiotic therapy.

If the patient is stable but fluctuance is present, the abscess requires simple I & D. In addition, a short course of oral antibiotics may be useful.

If the patient is quite ill, with evidence of an abscess or possible signs of necrotizing fasciitis or wet gangrene, he or she requires intravenous antibiotics, intravenous fluids, and urgent operative intervention.

Guide to Antibiotics

Antibiotic administration is often the cornerstone of the treatment of soft tissue infections. The following are general guidelines:

1. Remind the patient that more than one dose of an antibiotic is needed to see any significant difference.
2. Follow the patient closely because changes in antibiotic therapy may be needed. In addition, an area that you thought was merely cellulitis may show signs of an abscess at a later time.
3. Whenever possible, send a specimen of any drainage from the area to the lab for aerobic and anaerobic culture and Gram stain. The results of these studies help to guide your choice of antibiotic therapy.

Basic Skin Infections

The infecting organisms are usually staphylococci or streptococci. Treat with an extended penicillin (a drug related to penicillin that covers penicillin-resistant organisms) or a first-generation cephalosporin.

Animal Bites

Pasteurella spp. are associated with cat and dog bites. Treatment requires an antipseudomonal antibiotic (e.g., amoxicillin/clavulanate or cefuroxime). On the hand, cat bites have a much higher incidence of subsequent infection than dog bites (80% vs. 5%, respectively).

Human Bites

Eikenella spp., other anaerobes, and streptococci are associated with human bite infections. If the patient is seen early after the injury before signs of infection have developed, treat with amoxicillin/clavulanate. Once signs of infection are present, intravenous antibiotics such as amoxicillin/sulbactam or ticarcillin/clavulanate are indicated. The pathogens associated with human bites can cause serious infections that must be followed closely and treated aggressively, especially in bites to the hand (see chapter 36, "Hand Infections," for specific information).

Seawater and Shellfish Injury

If the affected area has the typical signs of cellulitis, treatment should cover bacteria of the *Vibrio* species. Appropriate agents include tetracycline or an aminoglycoside.

Freshwater Injury

Aeromonas hydrophila is associated with freshwater infection. A fluoroquinolone or trimethoprim/sulfamethoxazole should be used.

Enlarged Lymph Nodes in the Affected Area

The presence of enlarged lymph nodes may indicate cat-scratch disease, *Mycobacterium marinum* infection, sporotrichosis, or nocardial infection. An infectious disease specialist should be involved in the treatment of such patients.

Concerns about Foreign Bodies

If a foreign body is present in the infected tissues, the infection probably will not resolve until it is removed. However, a foreign body in soft tissues without cellulitis does not have to be removed unless it is causing symptoms.

Incision and Drainage of an Abscess

1. Do *not* be timid. You want to open the abscess cavity fully to prevent the abscess from reforming.
2. Local anesthetic often does not work well in infected tissues, but a block can be quite useful. Sometimes no anesthetic is required, or you may need only light sedation (see chapter 3, “Local Anesthesia,” for more details).
3. Make a longitudinal incision through the most fluctuant part of the abscess. Do not make the incision too small. It is often useful to excise an ellipse of skin, because the opening must be large enough to drain the abscess completely and allow you to pack the cavity with gauze.
4. Use the tips of a clamp to explore the abscess cavity gently and to ensure that it has been completely opened.
5. Send a specimen to the microbiology lab for evaluation.
6. Pack the wound with gauze.

Postoperative Care

1. The gauze packing should remain in place for 1 day.
2. Remove the gauze. Then repack the cavity with saline-moistened gauze and cover with dry gauze. The dressing should be changed 2–3 times/day until the wound has healed.
3. The patient may wash the area with gentle soap and water at each dressing change. Showering is permitted.
4. Antibiotics should be continued until the surrounding cellulitis resolves (probably for a few days).

Temporizing Measure for an Abscess in Need of Drainage

Sometimes you cannot perform the I & D without general anesthesia because of pain in the area and the extensive nature of the abscess. If you have to wait to get to the operating room for formal exploration, you can initiate treatment without anesthesia and prevent the patient from becoming more symptomatic.

An abscess can be decompressed by placing a large needle (18 gauge is adequate) into the cavity and aspirating the pus with a syringe. This technique relieves some of the pressure building up in the abscess pocket and helps to prevent the infection from worsening before definitive I & D is performed. Send a small amount of the aspirated fluid to the microbiology lab for analysis.

Bibliography

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