An individual with arm lymphedema develops flu-like symptoms: fever, chills, aches, headaches and nausea. The affected limb is red, warm, tender and is more edematous. The patient's physician notes the classic signs of acute inflammation: rubor (redness or erythema), calor (increased skin temperature), dolor (pain, tenderness) and swelling. A diagnosis of cellulitis is made and the patient is admitted for two days for treatment with IV antibiotics. Upon discharge, an oral antibiotic is prescribed for twelve days. The above scenario is common to lymphedema patients. This article will describe acute inflammatory episodes and their treatment.

There are various terms in the medical literature for acute inflammatory episodes and their treatment. This article will describe acute inflammatory episodes and their treatment.

Cellulitis and erysipelas are now considered possible to differentiate the two conditions. Erysipelas deeply, so it may not always be possible to differentiate the two conditions. Cellulitis is usually caused by a bacterial infection. Erysipelas is an infection of the superficial layers of the dermis and upper subcutaneous tissue with superficial lymphatic involvement. It is almost always caused by streptococcus pyogenes (Group A streptococcus). Classic erysipelas is characterized by a spreading, hot, erythematous rash with a well defined, raised edge but cellulitis may extend superficially and erysipelas deeply, so it may not always be possible to differentiate the two conditions. Cellulitis and erysipelas are now considered different presentations of the same condition by most experts so the term cellulitis refers to both conditions.1 Lymphangitis is an acute inflammation of the subcutaneous lymphatics usually caused by Streptococcus pyogenes. Red, warm, tender linear streaks are present, usually extending from a wound or skin infections toward regional lymph nodes. The nodes become swollen and tender.

MRSA refers to S. aureus strains that do not respond to antibiotics usually used to treat staph infections, and there are draining lesions such as pustules and abscesses. Per CDC guidelines, physicians can obtain either a small biopsy of skin or drainage from the infected site. A culture of a skin lesion is especially useful in recurrent or persistent cases of skin infection, in cases of antibiotic failure, and in cases that present with advanced or aggressive infections.

At times, the onset of cellulitis is less dramatic. A few red papules - “spots” – or a patch of erythema – a “rash” – may be present without constitutional symptoms. The papules or rash can spread to adjacent skin and coalesce. Aching discomfort and increased swelling may precede inflammation. The condition may remain subacute for days or weeks. A fever is present in only 26% at the time of active cellulitis.2 In these cases, it is necessary to consider other forms of acute inflammation such as thrombophlebitis, insect bites, and the various types of dermatitis.

Superficial thrombophlebitis can present with localized pain, cordlike induration, erythema and warmth. A deep vein thrombosis can be differentiated from cellulitis by performing a duplex Doppler ultrasound examination. Patients with lower extremity chronic venous insufficiency may have lipoedematosclerosis and stasis dermatitis. The most common bacterial infection associated with lymphedema is streptococcus pyogenes (Group A streptococcus). Non-Group A streptococcus, Staphylococcus aureus, Escherichia coli and pseudomonas infections are less common.

Simon and Cody3 reported cellulitis in 15 of 273 lymphedema patients (6%) over 42 months following axillary lymph node dissection. The mean interval between axillary lymph node dissection and the onset of cellulitis was 38 months. Mozes4 reported that 41% of patients with post-mastectomy lymphedema developed an acute inflammatory episode, the incidence increasing with the interval since the original cancer treatment.

Dankert, et al,5 reported that 9 of 336 patients who underwent a hysterectomy with pelvic lymphadenopathy developed cellulitis in their lower extremities. All nine patients had also been treated with pelvic radiation therapy. A retrospective study examining the incidence of cellulitis in patients with lymphedema found a 1% incidence in Stage 1 lymphedema, 27% in Stage 2 lymphedema and 72% in Stage 3 lymphedema6.

There are reports of lymphedema and cellulitis of the breast as a complication of breast-conserving surgery. Hughes7, et al, observed initial episodes of breast cellulitis in patients with breast-conserving surgery occurring before, during and after breast irradiation. They hypothesized that impaired lymphatic circulation after excision and/or irradiation, causes predisposition to cellulitis in the breast and adjacent soft tissues early in breast cancer treatment.

Brewer8, et al, performed a retrospective study of 17 patients and determined that the presence of lymphedema, drainage of a hematoma, the number of breast seroma
aspirations and resected breast tissue volume were associated with breast cellulitis. There was no association of cellulitis with tumor size, number of mammograms, radiation dose and radiodermatitis.

As noted by Mortimer, the “naïve view” of acute inflammatory episodes is that stagnant lymph fluid provides an ideal medium for bacterial growth. Numerous investigators have reported low yield of bacteria in microbiological specimens. The incidence of positive blood cultures is generally less than 10%. The isolated organism is usually a streptococcal species. Tissue cultures are positive in a slightly higher percentage of patients. Thus, it has been postulated that the local inflammatory response more commonly may be due to bacterial extracellular toxins rather than to the local proliferation of microorganisms. Semel cultured the interdigital spaces of patients with athlete’s foot who had cellulitis. Cultures yielded beta-hemolytic streptococci in 85% of the 20 cases. A group of controls with athlete’s foot and no cellulitis yielded significantly less beta-hemolytic streptococci.

DeLong and Simmons studied bacterial clearance from rabbit ears. The removal of bacteria by the regional lymphatics was insufficient to abort the infection process and occurred slowly within the initial 24 hours. The authors concluded that the phagocytosis of bacteria from soft tissues is of negligible importance as a host defense mechanism in the 6 hour decisive period of soft-tissue infection. Real clearance began after the bacteria has been phagocytosed and slowly lysed. de Goday, et al, performed lymphoscintigrams in 30 non-lymphedematous patients who had had at least two episodes of erysipelas 40 to 90 days after treatment. They concluded that most patients with repeated erysipelas have significant and even permanent abnormalities in regional lymphatic drainage. Damstra, et al found that in 79% of those with impaired lymph drainage in the limb with cellulitis, there was also impaired drainage in the unaffected limb.

RISK FACTORS

Any individual with lymphostasis or lymphedema is at risk for developing cellulitis. In the majority of patients, no antecedent event can be identified. Predisposing conditions include injury to the skin, lymphorrhea, stasis dermatitis and skin diseases such as eczema and psoriasis. Dermatophytosis – a superficial fungal infection - is a known risk factor for developing cellulitis, especially in patients with lower extremity lymphedema. Dermatophytes can invade the stratum corneum of the skin, hair or nails. Dermatophytosis is most common in the feet (tinea pedis), groin and intertriginous areas (tinea cruris) and the nails (onychomycosis). Tinea pedis results in itching and burning between the toes as well as scaling, erythema, maceration and fissures. Vesicles can be present in more severe cases. Tinea pedis can extend to the plantar surface.

RISK REDUCTION AND MANAGEMENT

Following the National Lymphedema Network Risk Reduction Guidelines should reduce the risk of developing cellulitis or reduce the frequency of these episodes. Proper skin care is important. This can be accomplished with meticulous hygiene, moisturization of the skin with emollients and prompt treatment of fungal infections. Compression bandages and garments should be washed daily.

The appropriate antibacterial therapy for treating cellulitis and lymphangitis is best determined by the treating physician since there are indications and contraindications for each antibiotic and antifungal medication. The beta-lactams (types of penicillins) are the class of antibiotics most often cited in the medical literature for the treatment of cellulitis. Mild early cellulitis presumed to be of streptococcal etiology can be treated with oral penicillin V 500 mg every 6 hours of amoxicillin 875 mg every 12 hours. When staphylococcal infection is suspected or there is a beta-lactam allergy, clindamycin 300 mg every 6 hours orally can be prescribed. For patients with known or suspected community acquired MRSA (CA-MRSA), with skin or soft tissue infections, oral antibiotics include the following: clindamycin, trimethoprim-sulfamethoxazole (TMP-SMX) double strength, one every 12 hours, a tetracycline (doxycycline or minocycline) 100 mg every 12 hours, an linezolid. 600 mg every 12 hours. When a tetracycline or trimethoprim-sulfamethoxazole is used and streptococcal coverage is desired, amoxicillin should be added. For severe or life threatening infections, intravenous antibiotics are necessary such as vancomycin 15 mg/Kg initially. If toxic shock syndrome is suspected, clindamycin 900 mg IV piggy back every 8 hours is often added. If co-morbidities such as diabetes, immune suppression or trauma are present, antificornials with gram negative coverage can be added.

Patients with lymphedema are known to have a prolonged systemic and local inflammatory response. Fever and tachycardia may persist for 6 or more days. The erythema may take several days to resolve. The increased edema may never return to baseline. Rest and elevation of the affected limb will help reduce the increased edema during the acute episode. Avoid non-steroidal drugs (NSAID) during the acute attack since these medications may be associated with complication such as necrotizing fasciitis.

Frequently, a formally well-fitting compression garment will become too tight due to the increased edema and should not be worn. The use of compression bandages, manual lymphatic drainage and exercises should be put on hold until the patient is without fever, the skin temperature returns to normal and the erythema is receding. Some patients may require outpatient complete decongestive therapy to reduce the edema.

Tinea pedis and tinea cruris can be treated with antifungal medication such as tolnaftate cream, micronazole cream, clotrimazole cream or lotion, ketoconazole cream, and cyclopirox cream or suspension. Tolinaftate and micronazole are...
available as powders and sprays and can be used in stockings to keep the feet dry and reduce the risk of developing tinea pedis. Oral antifungal medications are available. These include itraconazole and terbinafine.

**RECURRENT CELLULITIS:**

Individuals with two or more episodes of cellulitis per year are candidates for prophylactic antibacterial therapy. Penicillin has been the medication of choice for many years, either long-acting benzathine penicillin, 1,200,000 units intramuscular every 3 weeks for one year or oral penicillin V 0.25 to 0.5 gm/day. Patients allergic to penicillin can take erythromycin .25 to 0.5 gm/day.

Break-through episodes of cellulitis may occur while receiving prophylactic therapy and require full dose of an alternative antibiotic therapy. When the prophylactic antibiotic is discontinued, episodes of cellulitis may recur. One study reported that benzathine penicillin was not effective in preventing further episodes of cellulitis while another prospective study reported that acute inflammatory episodes were abolished in 41 of 45 patients. Early self-treatment by patients can help attenuate the severity of an episode of cellulitis by stopping bacterial replication in the initial stages and minimize further damage to the lymphatic system. Patients who have had a previous episode of cellulitis or are known to be at high risk for cellulitis should have an antibiotic readily available for immediate treatment if the symptoms and signs of cellulitis occur.

E. Földi reported that in women with arm lymphedema secondary to breast cancer treatment, there was a near elimination of recurrent cellulitis with improvement in arm swelling after complete decongestive therapy. Prophylactic antibacterial therapy was recommended for patients at high risk due to underlying skin conditions (psoriasis, fungal infection, dermatitis). The trace minerals and antioxidant selenium have not been shown to be effective in preventing acute inflammatory episodes.

The prevention and treatment of cellulitis is a challenge for the physician and the patient since each episode of infection can further impair lymphatic transport, increase the cost of medical care and stress the patient and caregivers. Those who treat lymphedema, including therapists and nurses, must educate the patient about the symptoms and signs of acute inflammatory episodes and review the NLN Risk Reduction Guidelines. The lifelong challenge for every patient is proper care of garments and to adhere to proper personal hygiene.

**REFERENCES**


