

Skin and Soft Tissue Infections in Older Adults

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Skin and soft tissue infections are frequent in older adults residing in both community and nursing homes. Common skin and soft tissue infections include bacterial infections such as cellulitis, erysipelas and necrotizing fasciitis, chronic wound infections, fungal infections such as intertrigo and viral infections like herpes zoster. Early diagnosis is the key to optimal management. Most of these infections can be treated on an outpatient basis and in nursing homes; however, serious infections may require hospitalization especially in frail older adults with a high comorbidity load. This review focuses on clinical manifestations and treatment options for common skin and soft tissue infections in older adults.

Key words: skin infections, cellulitis, necrotizing fasciitis, pressure ulcer, viral infection.

Infections in older adults are common and are a major source of morbidity and mortality. Every year approximately 1.5 million infections occur in nursing home residents in the U.S.;¹ overall rates range from 1.4–13.97 infections/1,000 resident days.^{1–3} Urinary tract, respiratory and skin and soft tissue infections are the most common among older adults residing in nursing homes. Older patients are particularly predisposed to skin infections due to several physiologic changes that occur with aging, including atrophy of epidermis and dermis, reduced resistance to external injury and prolonged wound healing.^{4–6} Additionally, aging dry pruritic skin serves as a portal of entry for various microbes. This review discusses clinical manifestations and treatments for the acute and chronic skin and soft tissue infections most commonly seen in older adults (Table 1).

Acute Bacterial Infections

Cellulitis and Erysipelas

Cellulitis is an acute spreading infection of the lower dermis and subcutaneous tissue and is typically caused by β -hemolytic streptococci and *Staphylococcus aureus*. Although less common, gram-negative pathogens like *Pseudomonas* spp., *Serratia* spp., *Proteus mirabilis* and *Klebsiella* spp. also may be responsible. A history of previous trauma such as a cut, laceration, puncture

wound or an underlying skin ulcer or furuncle is usually present. Cellulitis usually presents with local findings such as ill-defined redness, pain, edema and tender local lymph nodes (Figure), along with systemic findings such as fever, malaise and delirium (Table 2, page 43).

Older patients, especially nursing home residents, have a high risk of bacteremia resulting from cellulitis, which is associated with high morbidity and mortality. Cellulitis of lower extremities may be further complicated by thrombophlebitis. Furthermore, in patients with chronic dependent edema, cellulitis may spread extremely rapidly, underscoring the need for prompt treatment.

Mild early cellulitis can be treated with a penicillinase-resistant penicillin such as dicloxacillin or oral cephalosporins. Erythromycin can be used for penicillin-allergic patients. In more severe cases, parenteral administration of a penicillinase-resistant penicillin, such as nafcillin, should be used, with vancomycin in penicillin-allergic patients. If gram-negative pathogens are suspected, gentamicin may be added while awaiting etiology. In the setting of diabetes mellitus and diabetic leg ulcer, the development of cellulitis may necessitate the use of a broader initial coverage with a parenteral cephalosporin and gentamicin. Cool sterile saline dressings may be used to remove any

discharge and patients should be asked to elevate their legs to reduce swelling. Peripheral pedal edema or lymphatic obstruction can lead to recurrent cellulitis, which can be reduced by good skin hygiene and use of support stockings.

Erysipelas is a unique type of acute, superficial cellulitis that affects dermis and upper subcutaneous tissue with prominent lymphatic involvement, usually affecting face and legs and typically caused by β -hemolytic *Streptococcus pyogenes*. Along with the classic “orange peel” appearance and a well-demarcated advancing margin (in contrast to cellulitis that presents with a diffuse margin), patients often present with malaise, fever and confusion (Table 2). As with cellulitis, erysipelas can spread rapidly and, if not diagnosed and treated promptly, can lead to severe tissue necrosis and bacteremia. The treatment of choice remains penicillin, with erythromycin and cephalosporins as second-line agents. In patients with diabetes mellitus or immunosuppression, erysipelas may be caused by a mixed bacterial infection including both gram-positive and gram-negative organisms. In such situations, patients may require intravenous cephalosporins.

Necrotizing Fasciitis

Necrotizing fasciitis, caused by many pathogens including invasive β -hemolytic streptococci, is a particularly destructive, rapidly spreading deep tissue necrosis. Fournier’s gangrene is a necrotizing fasciitis involving scrotum and penis. Predisposing factors include prior injury, surgery, irradiation, diabetes mellitus, immunosuppression and obesity.⁷ Clinicians must be vigilant for early signs of necrotizing fasciitis, which include high fever plus swelling and marked tenderness localized to a muscle group. Rapid diagnosis and treatment is critical for this potentially fatal condition. Fine-needle aspiration for Gram stain and frozen section tissue biopsy can help with early diagnosis. Magnetic resonance

Table 1

Common Skin and Soft Tissue Infections in Older Adults

Acute Bacterial Infections	Chronic Wound Infections	Fungal Infections	Viral Infections	Other Infections
Cellulitis and Erysipelas Necrotizing fasciitis	Pressure ulcers Diabetic foot ulcers Vascular ulcers	Intertrigo Tinea versicolor	Herpes zoster Herpes simplex Warts	Scabies Pediculosis Conjunctivitis

imaging (MRI) can be very useful for ascertaining the extent of necrosis.

Intravenous broad spectrum antibiotics to cover both aerobes and anaerobes should be given simultaneously with rapid and vigorous debridement of all necrotic tissue, usually under general anesthesia. Penicillin and clindamycin should be considered if streptococcal necrotizing fasciitis is suspected.

Chronic Wound Infections

Infected Pressure Ulcers

Pressure ulcers in older adults are frequent, morbid and an enormous economic burden to the health care system. In nursing homes, the prevalence of pressure ulcers varies, ranging from 1.2–11.3% depending on the population studied.^{8,9} The frequency of infected pressure ulcers has not been well studied in nursing homes. However, in a point prevalence study, 6% of 532 nursing home residents received treatment for infected pressure ulcers.¹⁰

Management of a potentially infected pressure ulcer involves clinical exam, microbiologic evaluation, imaging studies and histopathological examination of deep tissue biopsy specimens. Pressure ulcer sites should be examined for local signs of soft tissue infection such as warmth, erythema, local tenderness, discharge and presence of foul odour (Table 2). Examination of wounds to detect early changes is especially important since systemic signs, such as fever and leukocytosis, may not be obvious. Clinical examination often underestimates the degree of deep tissue involvement, and its findings are inadequate for detection of associated osteomyelitis. While superficial microbiologic cultures are not useful, deep tissue biopsy may be helpful in directing antimicrobial therapy, but may be inadequate in

diagnosing infection. Osteomyelitis is a frequent complication of infected pressure ulcers. The high pretest clinical probability should be confirmed with MRI or fine-needle biopsy to avoid inappropriate and prolonged antibiotic therapy.

Diabetic Wound Infections

Older diabetic adults have a high number of chronic diabetic wound infections than younger diabetics, especially in the foot. Since infected, non-healing ulcers are a major cause of lower limb amputation in diabetics, aggressive treatment of foot ulcers is crucial. Management includes an assessment for the presence of risk factors such as poor control of diabetes, presence of neuropathy, history of amputation or prior ulcers, evidence of peripheral vascular disease, foot deformities, presence of pedal edema and poor nutrition. If infection is detected, the appropriate infection control and antibiotic treatment measures should be taken.

Thorough debridement with the goal of removing all devitalized tissue is one of the key steps to promoting the healing of foot ulcers. Periwound hyperkeratosis should be debrided and the wound margin "saucerized" so that it slopes like a bowl, which reduces pressure. Enzymatic debridement with products containing enzymes to lyse fibrin or denature collagen to bring about degradation of necrotic tissue also can be employed. Moisture-retentive dressings such as films or hydrocolloids can be used with an aim to induce autolytic debridement. However, they should not be used in clinically infected wounds or immunosuppressed patients due to the potential for infection.

Relief of pressure from the area of a foot ulcer is vital for wound healing and ultimately for preventing infections. Plaster casting or total casting for treatment

of clean, uninfected neuropathic wounds has been used to reduce pressure with success. Well-fitting shoes also can reduce pressure in a non-ulcerated foot.

Ulcers should be evaluated carefully for any evidence of infection, including osteomyelitis. Topical antibiotics are not indicated as a primary line of therapy; however, they may be used in conjunction with oral or intravenous antibiotic therapy. Iodine-containing solutions (e.g., bleach, hydrogen peroxide) should be used only for a brief amount of time due to cytotoxicity. Hand hygiene education to the patients and their caregivers is also important to prevent infection. Mild infections can be treated with amoxicillin, clavulanate, cephalexin and clindamycin. However, patients with fever, severe cellulitis, gangrene or osteomyelitis should be hospitalized for treatment.

Vascular Ulcers

Venous ulcerations are usually painless, although pain may be a sign of accompanying arterial insufficiency, neuropathy or infection. Characteristically, ischemic pain is more pronounced when the leg is elevated, such as overnight. Development of infection in vascular ulcers leads to non-healing and subsequent progression. Infection is associated with slough, malodour and increased exudates with the area around the ulcer showing erythema, swelling, increased warmth and tenderness. Serious infections may be associated with fever, malaise and confusion. Oral or parenteral antibiotics are required, usually for three to four weeks.

Routine administration of antibiotics in patients with ulcers (without infection and cellulitis) does not prevent infection or improve healing. It can lead to antibiotic resistance and thus is usually not recommended.

Presentation of Cellulitis

A history of trauma, such as a laceration, puncture wound or underlying skin ulcer, is usually present.

Cellulitis

Cellulitis usually presents with local findings such as redness, pain and edema, as well as systemic findings such as fever, malaise and delirium.

Staphylococcus aureus

Cellulitis is an acute infection of the lower dermis and subcutaneous tissue typically caused by β -hemolytic streptococci and *Staphylococcus aureus*.

Table 2

Clinical Features of Common Skin and Soft Tissue Infections in Older Adults

Infection	Local Findings	Systemic Findings	Predominant Causative Pathogens
Cellulitis	Ill-defined redness, pain, edema, local tender lymph nodes	Fever, malaise, delirium	β -hemolytic streptococci, <i>Staphylococcus aureus</i> , gram-negative pathogens
Erysipelas	"Orange peel" appearance, well-demarcated advancing margins	Fever, malaise, delirium	β -hemolytic <i>Streptococcus pyogenes</i>
Necrotizing fasciitis	Swelling, marked tenderness	Fever	β -hemolytic streptococci, anaerobes
Infected ulcer	Warmth, erythema, tenderness, discharge, foul odour	Fever, malaise, fatigue	Usually polymicrobial
Intertrigo	Confluent, erythematous rash with satellite lesions	—	<i>Candida</i> spp.
Herpes zoster	Pain, erythematous macular popular rash progressing to vesicular rash involving one dermatome	Involvement of more than one dermatome	Varicella zoster virus (VZV)

Fungal Infections

Intertrigo

Intertrigo, a *Candida* infection of the skin, involves moist areas of the body, typically under pendulous breasts and in the perineum. It usually presents with confluent, erythematous rash with satellite lesions. Diagnosis is usually made clinically; however, if no improvement is noted within one to two weeks of initiating local therapy, or if the lesions are extensive needing systemic therapy, microscopic examination of scrapings from the lesion may be warranted. Intertrigo usually responds to topical creams and lotions, such as nystatin, clotrimazole or miconazole. For patients with extensive skin lesions, oral azole agents such as itraconazole or fluconazole may be used. To avoid recurrence, the affected areas must be kept as dry as possible.

Viral Infections

Herpes Zoster

Herpes zoster, also known as shingles, is the recurrence of varicella (chicken pox) infection, albeit in a more localized form. The pain associated with acute zoster and post-herpetic neuralgia is neuropathic and results from injury of the peripheral nerves and alteration in central nervous system signal processing. The risk of post-herpetic neuralgia increases with age, and affects nearly half of untreated adults over 65

years old. Patients usually present with pain within the involved dermatome, followed by erythematous maculopapular lesions that rapidly evolve to the characteristic vesicular rash. The lesions continue to form over three to five days, with resolution requiring approximately 10–30 days. Thoracic dermatomes are most frequently involved (approximately 55%), with cranial, cervical and lumbar dermatomes each accounting for approximately 10% of cases.

Diagnosis is usually made by history and physical examination. Erupted vesicles do carry a risk of superinfection with *S. aureus*. Early diagnosis is important because treatment with antiviral agents such as acyclovir, famciclovir or valacyclovir can reduce symptoms and duration of disease if given within 48–72 hours of rash development. The use of steroids remains controversial—most studies show they do not reduce the incidence of post-herpetic neuralgia. A live attenuated varicella vaccine is available and its use in the older population is under evaluation.

Conclusion

Skin and soft tissue infections are frequently found in older adults. An accurate diagnosis is critical for prompt treatment. Choice of antibiotic therapies should take into consideration the organisms commonly responsible for a partic-

ular skin infection and local susceptibility patterns. Additionally, attention should be paid to the predisposing factors in order to prevent future infections. ♦

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