

An Overview of Cellulitis and its Management

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ABSTRACT:

Cellulitis is a common bacterial skin infection, this review gives information about Etiology, epidemiology, evaluation and treatment of cellulitis. It provides the latest updates on how to accurately diagnosis, effectively treat and manage patients with bacterial cellulitis. upon completing this review, one should be able to differentiate cellulitis from other mimers correctly. This review discern When cellulitis treatment is appropriate in the outpatient setting with oral antibiotics versus when a patient is hospitalized and treated with intravenous antibiotics and how the interprofessional team can best manage patients with cellulitis

Cellulitis is a type of skin infection that affects the deeper layers of the skin and the underlying tissues. It typically occurs when bacteria, such as Streptococcus or Staphylococcus, enter the skin through breaks like cuts, wounds, or even insect bites. These bacteria then multiply and cause inflammation, leading to the characteristic symptoms of cellulitis. The most common signs of cellulitis include redness, swelling, warmth, and pain in the affected area. The skin may also feel tender to the touch and appear shiny or stretched. In some cases, there may be the presence of blisters, abscesses, or areas of skin breakdown.

Cellulitis commonly occurs on the lower legs, but it can also affect other areas of the body, such as the arms, face, or abdomen. People with compromised immune systems, chronic conditions like diabetes, or those with poor circulation are at a higher risk of developing cellulitis. Prompt medical attention is crucial for cellulitis, as it requires proper diagnosis and treatment. The healthcare provider should prescribe antibiotics to combat the bacterial infection. It's important to take the full course of antibiotics as prescribed, even if symptoms improve, to ensure complete eradication of the infection.

In addition to antibiotics, your doctor may recommend elevating the affected area, applying warm compresses, and taking over-the-counter pain relievers to alleviate symptoms. It's also essential to keep the affected area clean and dry to prevent further infection. If left untreated, cellulitis can lead to serious complications such as the spread of infection to the bloodstream or surrounding tissues. Therefore, it's crucial to seek medical attention promptly if you suspect cellulitis.

KEYWORDS: Cellulitis, bacterial infection, inflammation, antibiotics,

I. INTRODUCTION:

Cellulitis is usually a bacterial infection involving the inner layers of the skin. It specifically affects the dermis and subcutaneous fat. The borders of the area of redness are generally not sharp and the skin may be swollen. While the redness often turns white when pressure is applied, this is not always the case. The area of infection is usually painful. Lymphatic vessels may occasionally be involved, and the person may have a fever and feel tired.

The legs and face are the most common sites involved, although cellulitis can occur on any part of the body. The leg is typically affected following a break in the skin. Other risk factors include obesity, leg swelling, and old age. For facial infections, a break in the skin beforehand is not usually the case. The bacteria most commonly involved are streptococci and Staphylococcus aureus. In contrast to cellulitis, erysipelas is a bacterial infection involving the more superficial layers of the skin, present with an area of redness with well-defined edges, and more often is associated with a fever.

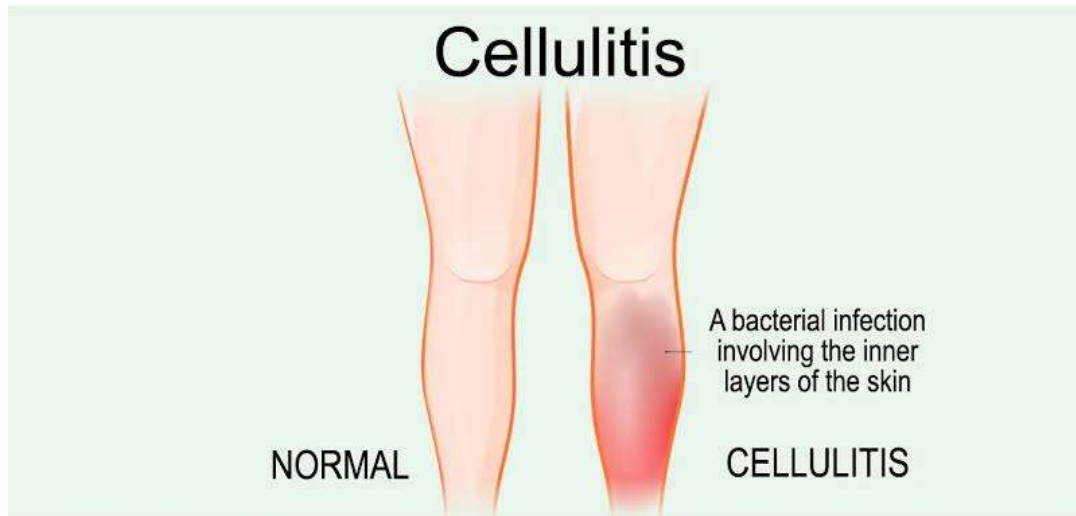


Fig no 1: Lower limb Cellulitis

TYPES OF CELLULITIS:

There are different types of cellulitis, depending on where the infection occurs.

Some types include:

- periorbital cellulitis: which develops around the eyes
- Facial cellulitis: which develops around the eyes, nose, and cheeks
- Breast cellulitis
- Perianal cellulitis: which develops around the anal orifice

II. RESULTS AND DISCUSSION: ETIOLOGY:

The skin serves as a protective barrier preventing normal skin flora and other microbial pathogens from reaching the subcutaneous tissue and lymphatic system. When a break in the skin occurs, it allows for normal skin flora and other bacteria to enter into the dermis and subcutaneous tissue. The introduction of these bacteria below the skin surface can lead to an acute superficial infection affecting the deep dermis and subcutaneous tissue, causing cellulitis. Cellulitis most commonly results from infection with group A beta-hemolytic streptococcus i.e., *Streptococcus pyogenes*.

Risk factors for cellulitis include any culprit that could cause a breakdown in the skin barrier such as skin injuries, surgical incisions, intravenous site punctures, fissures between toes, insect bites, animal bites, and other skin infections. Patients with comorbidities such as diabetes mellitus, venous insufficiency, peripheral

arterial disease, and lymphedema are at higher risk of developing cellulitis.

EPIDEMIOLOGY:

This study found a cellulitis incidence rate of 24.6/1000 person-years, a higher incidence of cellulitis in males of all ages, an increasing incidence of cellulitis with increasing age, and that most cellulitis cases (78%) received treatment in outpatient settings. This was a higher incidence rate than other population-based studies. Less than one-fifth of patients had developed a recurring infection or required care for longer than 28 days. Additionally, there was a low incidence of lymphangitis, lymphadenitis, erysipelas, and necrotizing fasciitis among enrollees and a higher relative risk of cellulitis during summer months compared to winter months. The lower extremity is the most common site of cellulitis among both males and females, although this finding is limited by the large number cases where the body location is not stated.

PATHOPHYSIOLOGY:

Cellulitis is characterized by erythema, warmth, edema, and tenderness to palpation resulting from cytokine and neutrophil response from bacteria breaching the epidermis. The cytokines and neutrophils are recruited to the affected area after bacteria have penetrated the skin leading to an epidermal response. This response includes the production of antimicrobial peptides and keratinocyte proliferation and is postulated to produce the characteristic exam findings in cellulitis. Group A Streptococci, the most common bacteria to cause cellulitis, can also produce

virulence factors such as pyrogenic exotoxins (A, B, C, and F) and streptococcal superantigen that can lead to a more pronounced and invasive disease.

SIGNS AND SYMPTOMS:

Cellulitis usually occurs on one side of the body. Its signs and symptoms may include:

- An irritated area of skin that tends to expand.
- Swelling.
- Tenderness.
- Pain.
- Warmth.
- Fever.
- Chills.
- Spots.
- Blisters.
- Skin dimpling.

RISK FACTORS:

Several factors increase the risk of cellulitis:

- Injury: Any cut, fracture, burn or scrape gives bacteria an entry point.
- Weakened immune system: Conditions that weaken the immune system such as diabetes, leukemia and HIV/AIDS increase the risk of infection. Certain medications also can weaken the immune system.
- Skin conditions: Conditions such as atopic dermatitis (eczema), athlete's foot and shingles can cause breaks in the skin, which give bacteria an entry point.
- Long-term (chronic) swelling of the arms or legs (lymphedema): This condition sometimes happens after surgery.
- History of cellulitis: Having had cellulitis before increases the risk of getting it again.
- Being overweight: Excess weight increases the risk of developing cellulitis.

COMPLICATIONS:

Without prompt diagnosis and treatment, cellulitis could lead to several complications. If the bacterial infection reaches the bloodstream, it could lead to bacteremia. Bacteremia is diagnosable by obtaining blood cultures in patients who exhibit systemic symptoms. The clinician should obtain identification and susceptibilities from the blood cultures and tailor antibiotics accordingly. Failure to identify and treat bacteremia from cellulitis can lead to endocarditis, an infection of the inner lining (endocardium) of the heart.

Patients who have cellulitis along with two or more SIRS criteria (fever over 100.4 degrees F, tachypnea, tachycardia, or abnormal white cell count) get diagnosed with sepsis. If cellulitis moves from the deep dermis and subcutaneous tissue to the bone, it can lead to osteomyelitis.

Cellulitis that leads to bacteremia, endocarditis, or osteomyelitis will require a longer duration of antibiotics and possibly surgery.

DIAGNOSIS:

A detailed clinical history is obtained as the doctor will need to know about conditions such as diabetes or weakened immunity. The doctor will also want to rule out other conditions that can cause similar symptoms to cellulitis such as varicose eczema which can cause itchy skin and ulcers.

- A physical assessment is performed to check for signs such as wounds or skin breaks near the affected area.
- If there is an open wound, the doctor takes a swab from the area and sends it for laboratory testing so that the type of bacteria causing the infection can be identified.
- A suitable antibiotic for targeting the bacteria is then selected.

Additional tests may be carried out if symptoms seem severe and hospitalization is required in cases of gangrene or toxic shock syndrome, for example. Blood tests will show whether the infection-fighting white blood cells are raised or the platelet count is low.

- If uncontrolled diabetes is a contributing factor, then blood sugar may be high.
- Blood creatinine may be raised in cases of group A streptococcal infection, toxic shock syndrome or clostridium infection.
- Low blood bicarbonate levels indicate metabolic acidosis and septic shock.
- Low blood albumin may indicate diffuse capillary leak syndrome which can lead to swelling of soft tissue and pulmonary edema.
- A decreased calcium level indicates staphylococcal or streptococcal toxic shock syndrome.
- Imaging studies such as X-ray, CT-scan.

DIFFERENTIAL DIAGNOSIS:

Cellulitis is a frequently encountered infection of the deep dermis and subcutaneous tissue, mainly affecting the lower extremities, but it can have many mimickers.

Erysipelas is sometimes considered a form of cellulitis. However, it is a more superficial

infection affecting the upper dermis and superficial lymphatic system. Bright red erythema, elevation of the affected skin, and well-demarcated borders can help to diagnose erysipelas and distinguish it from cellulitis, which tends to be more mildly erythematous (pink) and flat with less distinct boundaries. Erysipelas may also have streaking when superficial lymphatics are involved. It most commonly results from the exotoxins released from group A strep (*Streptococcus pyogenes*). First-line treatment for erysipelas is amoxicillin or cephalexin.

Chronic venous stasis dermatitis is a long-standing, bilateral, inflammatory dermatosis secondary to chronic venous insufficiency and typically involves the medial malleoli. It appears on the lower extremities and manifests as erythema with scaling, peripheral edema, and hyperpigmentation. Treatment focuses on treating the underlying chronic venous insufficiency and its sequelae, such as lower extremity edema.

TREATMENT AND MANAGEMENT:

Patients presenting with mild cellulitis and displaying no systemic signs of Infection should be covered with antibiotics that target the treatment of streptococcal species. Though believed to be a less common cause, consider coverage of MSSA. The duration of oral antibiotic therapy should be for a minimum duration of 5 days. In nonpurulent cellulitis, patients should receive cephalexin 500 mg every 6 hours. If they have a severe allergic reaction to beta- lactamase inhibitors, treat with clindamycin 300 mg to 450 mg every 6 hours.

In patients with purulent cellulitis, methicillin-resistant staph aureus colonization, cellulitis associated with an abscess or extensive puncture wounds. or a history of intravenous drug use, patients should receive antibiotics that cover against methicillin-resistant staph aureus as well. Cellulitis with MRSA risk factors should be treated with trimethoprim-sulfamethoxazole 800 mg/160 mg twice daily for 5 days in addition to cephalexin 500 mg every 6 hours. If a patient has an allergy to trimethoprim-sulfamethoxazole, treat with clindamycin 300 mg to 450 mg every 6 hours. A longer duration of antibiotic treatment may be a consideration in patients who show minimal improvement with antibiotic therapy within 48 hours. Hospitalization with the induction of systemic antibiotics may be necessary for patients who: present with systemic signs of infection", have failed outpatient treatment, are immunocompromised, exhibit rapidly progressing erythema, are unable to tolerate oral medications,

or have cellulitis overlying or near an indwelling medical device.

Intravenous antibiotics should be initiated to cover against group A strep. Absent patient risk factors for MRSA, treat with intravenous cefazolin, and when able de-escalate to cephalexin for a total of 5 days of treatment. If risk factors for MRSA are present, initiate therapy with Vancomycin with subsequent de-escalation to trimethoprim/sulfamethoxazole. In immunocompromised patients requiring hospitalization for parenteral antibiotics, broad-spectrum antimicrobial coverage may be necessary with vancomycin plus piperacillin-tazobactam or a carbapenem.

The clinician should obtain blood cultures if a patient is exhibiting signs of systemic toxicity, has persistent cellulitis despite adequate treatment, has unique exposures such as animal bites or water-associated injuries. Atypical organisms can cause cellulitis in particular situations. If exposed to a dog or cat bite, patients are at risk for developing cellulitis secondary to *Pasteurella multocida*. If secondary to an injury involving exposure to water. such as a cut from an oyster shell, cellulitis can be caused by *Vibrio vulnificus*. Diabetic patients and patients with diabetic foot ulcers are at risk for *Pseudomonas aeruginosa*. Immunocompromised patients are at risk for *Pseudomonas aeruginosa* and *Cryptococcus*.

If patients have significant edema with a known cause for the edema, the underlying condition should receive proper treatment to decrease the amount of edema and prevent future episodes of cellulitis. Patients should be instructed to keep the affected area elevated. Two or more of these systemic inflammatory response criteria: fever (over 38 degrees C), tachycardia (heart rate exceeding 90 beats/min), tachypnea (respiratory rate over 20 breaths/min), leukocytosis (white blood cells in excess of 12000/mm) leukopenia (white blood cells under 4000/mm) or bandemia greater than or equal to 10%.

SURGERY:

Most of the time, antibiotics are enough to treat cellulitis. Surgery usually isn't necessary, unless it's need to open and drain an abscess or remove pus that has collectd in the tissue.

"Hypodermectomy" consists of resecting the sclerotic sub-malleolar plaque of adipose tissue, together with the responsible perforators. The operation is preceded by a long period of elastocompression. It is carried out under local anaesthetic and completed by a long or short

saphenectomy, according to the case. The incision involves the entire inner surface of the leg. This long incision is vital to the reshaping of the hypodermis and the maintenance of the leg's outline. The dermis joined to the plaque has to be resected if it is much damaged. The operation thus becomes a "dermohypodermectomy". The elastocompression is continued post-operatively, with mobilisation, until complete recovery. This treatment is indicated in all cases of cellulitis (sclerotic plaque) which are not cured completely by several months' elastocompression. Age does not constitute a contra-indication, as long as there is no arteriopathy.

PREVENTION:

The following can help to decrease the risk of getting cellulitis again:

- Avoid injuring the skin. Skin injuries include cuts, scrapes, burns, sunburns, frostbite, stings from bees and other insects, and abrasions. Being careful while doing any activity, including working out, gardening, or cooking can help avoid an injury.

Steps to treat the wounds immediately after an injury:

- Wash the wound with soap and water.
- Apply an antibiotic ointment.
- Cover the wound with a bandage.
- Clean and change the bandage every day (or as often as the doctor recommends) until the wound heals.
- Keep the skin clean and moisturized. Keeping the skin clean washes away bacteria that cause cellulitis. Moisturizing helps prevent cracks in the skin, which can let bacteria into the body.
- An effective way to prevent or reduce dry skin is to apply moisturizer within three minutes of taking showers or baths. If hands are dry, applying moisturizer after washing hands and frequently throughout the day can relieve the dryness.
- Keep nails well-manicured. Don't scratch or injure the skin while cutting finger nails or toe nails
- If cellulitis in an arm have blood drawn from the arm that has not had cellulitis. Be sure to ask the person drawing the blood to take it from a part of the body that has not had cellulitis.
- Treat infections promptly. An infection like athlete's foot or impetigo can lead to cellulitis, so treat it as soon as notice signs. Dry, itchy skin between the toes can mean athlete's foot. Sores, red and swollen skin, or blisters can be a sign of an infection.

- Treat other medical conditions. Having another medical condition can increase the risk of getting cellulitis again. Working with the doctor to manage conditions like diabetes, eczema, leg ulcers, or periphery artery disease (PAD) can greatly reduce the cellulitis risk.
- Treat lymphedema (excessive fluid buildup that causes swelling, usually in an arm or leg). Of all the medical conditions that increase the risk of getting cellulitis again, lymphedema ranks highest. While there is no cure for lymphedema, it can be treated with exercise, compression bandages, elevation, and drainage.
- Lose weight. Research shows that over weight or obese can increase the getting of cellulitis again.
- Stop smoking. While more research is needed to know whether smoking increases the risk of getting cellulitis again, research suggests it might.

III. CONCLUSION:

In conclusion, cellulitis is a common bacterial skin infection that can lead to significant morbidity if not promptly recognized and treated. It typically presents with localized redness, warmth, swelling, and pain, often accompanied by systemic symptoms such as fever and malaise. The most common causative organisms are *Staphylococcus aureus* and *Streptococcus pyogenes*. Prompt initiation of antibiotic therapy covering these pathogens is essential to prevent complications such as abscess formation, sepsis, and tissue necrosis. In addition to antibiotics, supportive measures such as elevation, rest, and pain management are crucial for symptom relief and expedited recovery. While cellulitis is generally a self-limiting condition, patients with certain risk factors such as immunosuppression or chronic edema may experience recurrent episodes or complications requiring specialized management. Early recognition, appropriate treatment, and diligent follow-up are key to minimizing the morbidity associated with cellulitis and ensuring optimal outcomes for affected individuals.

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