Skin Infections (Cellulitis, Erysipelas…)

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The most common skin and soft tissue infections are cellulitis and erysipelas

- Cellulitis (which includes erysipelas) manifests as an area of skin erythema, edema, and warmth ;as a result of bacterial entry via breaches in the skin barrier

- Cellulitis is observed at any age, a seasonal predilection for warmer months
- Erysipelas occurs in young children and older adults

- A skin abscess is a collection of pus within the dermis/subcutaneous space
- Skin abscess may occur in healthy individuals with no predisposing conditions

Predisposing Risks of Cellulitis and/or Skin Abscess

- ✓ Skin barrier disruption due to trauma (abrasion, penetrating wound, pressure ulcer, venous leg ulcer, insect bite, injection drug use)
- ✓ Skin inflammation (eczema, radiation therapy, psoriasis)
- ✓ Edema due to impaired lymphatic drainage
- ✓ Edema due to venous insufficiency
- ✓ Obesity
- ✓ Pre-existing skin infection (impetigo, varicella)
- ✓ Lymphatic compromise may occur following surgical procedures (lymph node dissection)/in the setting of congenital abnormalities
- ✓ Close contact with others with methicillin-resistant *S. aureus* infection/ carriage
- ✓ Immunosuppression (diabetes/HIV infection)

Microbiology

- The most common cause, *beta-hemolytic streptococci (groups A, B, C, G, and F), group A Streptococcus; S. aureus* (methicillin-resistant strains) is a less common cause
- Gram-negative aerobic bacilli, a minority of cases
- Less common causes, *Haemophilus influenzae* type b (buccal cellulitis), *Streptococcus pneumoniae,* and *Neisseria meningitidis*
- The vast majority of *erysipelas* cases are caused by *beta-hemolytic streptococci*
- In immunocompromised patients, the spectrum of potential pathogens is much broader, infectious disease consultation

- Skin abscess, Either MSSA /MRSA) (٧٥%)
- Many patients with MRSA infection have no risk factors
- B*y more than one pathogen* ; isolation of multiple organisms (*S. aureus* together with *S. pyogenes* and gram-negative bacilli with anaerobes),more common in patients with skin abscess involving the perioral, perirectal, vulvovaginal areas
- Unusual causes of skin abscess, nontuberculous mycobacteria, blastomycosis, nocardiosis, and cryptococcosis
- Most abscesses are due to infection
- Sterile abscesses can occur in the setting of injected irritants
- Injected drugs (oil-based ones) that may not be fully absorbed and so remain at the site of injection, causing local irritation
- Sterile abscesses can turn into hard, solid lesions as they scar

CLINICAL MANIFESTATIONS

Cellulitis Vs Erysipelas

- Cellulitis and erysipelas, as areas of skin erythema, edema, and warmth; they develop as a result of bacterial entry via breaches in the skin barrier
- Petechiae and/or hemorrhage can be seen in erythematous skin, and superficial bullae can occur. Fever and other systemic manifestations of infection
- Unilateral, and the lower extremities, the most common site of involvement
- *Bilateral involvement should prompt consideration of alternative causes*
- Cellulitis involves the deeper dermis and subcutaneous fat; erysipelas involves the upper dermis and superficial lymphatics
- Cellulitis may present with/without purulence; erysipelas is nonpurulent
- Patients with cellulitis tend to have a more indolent course with development of localized symptoms over a few days

*Cellulitis Vs Eysipelas **

- Erysipelas, acute onset of symptoms with systemic manifestations, fever, chills, severe malaise, and headache; these can precede onset of local inflammatory signs and symptoms by minutes to hours
- In erysipelas, clear demarcation between involved and uninvolved tissue
- A raised, advancing border/erythema with central clearing
- Classic descriptions of erysipelas note "butterfly" involvement of the face

Other Forms of Cellulitis

- Orbital cellulitis, abdominal wall cellulitis (in morbid obesity), buccal cellulitis (due to *S. pneumoniae* and, prior to the conjugate vaccine era, *H. influenzae* type b) and perianal cellulitis (group A beta-hemolytic *Streptococcus*)

Erysipelas

CellulitIs

Additional Manifestations of Cellulitis& Erysipelas

- Lymphangitis and enlargement of regional lymph nodes. Edema surrounding the hair follicles may lead to dimpling in the skin, creating an appearance reminiscent of an orange peel texture ("peau d'orange")
- Vesicles, bullae, and ecchymoses or petechiae may be observed
- Cutaneous hemorrhage, in the setting of significant inflammation in the skin
- Crepitant and gangrenous cellulitis are unusual manifestations of cellulitis due to clostridia and other anaerobes. Severe manifestations with systemic toxicity, prompt investigation for additional underlying sources of infection

Skin Abscess

- A skin abscess is a collection of pus within the dermis or subcutaneous space
- As a painful, fluctuant, erythematous nodule, with/without surrounding cellulitis
- Spontaneous drainage of purulent material may occur, Regional adenopathy
- Fever, chills, and systemic toxicity are unusual
- May develop via deep infection of a hair follicle (as a furuncle/boil), which reflects extension of purulent material through the dermis into the subcutaneous tissue. Multiple furuncles can coalesce to form carbuncles , which may be associated with systemic symptoms
- Common areas of involvement, the back of the neck, face, axillae, and buttocks
- ***Complications,*** bacteremia, endocarditis, septic arthritis/osteomyelitis, metastatic infection, sepsis, and toxic shock syndrome

Furuncle

Carbuncle

Folliculitis

DIAGNOSIS

- Is usually based upon *clinical manifestations*
- Cellulitis and erysipelas manifest as areas of skin erythema, edema, and warmth
- Erysipelas lesions are raised above the level of surrounding skin with clear demarcation between involved and uninvolved tissue. A skin abscess manifests as a painful, fluctuant, erythematous nodule, with or without surrounding cellulitis
- Laboratory findings, nonspecific, leukocytosis and elevated ESR and CRP
- *Laboratory testing is not required for patients with uncomplicated infection in the absence of comorbidities/complications*
- Patients with drainable abscess, undergo incision and drainage
- Routine culture of debrided material is not necessary in healthy patients who do not receive antibiotics

Radiographic Examination

- Radiographic examination can be useful to determine whether a skin abscess is present (via ultrasonography) and for distinguishing cellulitis from osteomyelitis (via MRI)

- *Radiographic evaluation may be warranted* in patients with underlying immunosuppression, diabetes, venous insufficiency, or lymphedema and in patients with persistent systemic symptoms

- Radiographic examination cannot reliably distinguish cellulitis from necrotizing fasciitis or gas gangrene; if there is clinical suspicion for these entities, radiographic imaging should not delay surgical intervention

DIFFERENTIAL DIAGNOSIS

Cellulitis and erysipelas — Cellulitis is often confused with other infections/noninfectious illnesses

Rapidly progressive erythema with signs of systemic toxicity should prompt consideration of severe infection:

- Necrotizing fasciitis, a deep infection that results in progressive destruction of the muscle fascia. The affected area may be erythematous, swollen, warm, and exquisitely tender. Pain out of proportion to exam findings .The diagnosis, surgically with visualization of fascial planes
- Toxic shock syndrome, with pain that precedes physical findings. Clinical signs of soft tissue infection consist of local swelling and erythema, ecchymoses and sloughing of skin. Fever is common. Patients may be normotensive on presentation but subsequently become hypotensive
- Gas gangrene/ myonecrosis, fever and severe pain in an extremity, particularly in the setting of recent surgery/trauma. The presence of tissue crepitus favors clostridial infection. Gas gangrene, be detected radiographically

Cellulitis must be distinguished from other infections :

- Erythema migrans, an early manifestation of Lyme disease; a region of erythema at the site of a tick bite, with central clearing and a necrotic center.The diagnosis, serologic testing
- Herpes zoster, as erythematous papules that evolve into grouped vesicles The rash, in one dermatome but can affect two/three neighboring dermatomes. The diagnosis, by PCR
- Cellulitis may overlie a septic joint. joint pain, swelling, warmth, and limited range of motion. The diagnosis of septic arthritis, synovial fluid examination
- Cellulitis may precede or accompany septic bursitis. Distinguishing cellulitis with and without bursitis depends on skilled palpation. Radiographic imaging, if septic bursitis is suspected
- Osteomyelitis ,may underlie an area of cellulitis, imaging for assessment of bone involvement in chronic soft tissue infection that fails to improve with appropriate antibiotic therapy

Noninfectious masqueraders of cellulitis (unilateral)

- Contact dermatitis, lesions are pruritic, erythema, edema, vesicles, bullae, and oozing, the reaction in the site of contact with burning, stinging, pain
- Drug reaction, an erythematous maculopapular rash that involves the trunk and proximal extremities. pruritus, low-grade fever, mild eosinophilia
- The diagnosis is suspected in a patient receiving drug treatment who presents with a rash of recent onset. The clinical suspicion, histopathologic examination of a skin biopsy
- Vasculitis, The morphology of cutaneous lesions, variable. Macular and papular (palpable purpura) lesions are nonblanchable due to the presence of extravasated erythrocytes in the dermis, which occurs as a result of damaged vessel walls. The diagnosis, by skin biopsy

*Noninfectious masqueraders of cellulitis (unilateral)**

- Insect bite, an inflammatory reaction at the site of the punctured skin, which appears within minutes and consists of pruritic local erythema and edema. a local reaction is followed by a delayed skin reaction consisting of local swelling, itching, and erythema
- Deep venous thrombosis, cellulitis involving the lower extremity should prompt consideration of DVT; the evaluation consists of ultrasound evaluation
- Panniculitis, inflammation of subcutaneous fat and may have many causes, both infectious and noninfectious The diagnosis, biopsy
- Vaccination site reaction, A local reaction to vaccination manifests with erythema, swelling, and tenderness at the injection site; these are typically self-limited

Noninfectious masqueraders of cellulitis (bilateral)

- Stasis dermatitis, an inflammatory dermatosis of the lower extremities that occurs in patients with chronic venous insufficiency. usually bilateral but can be unilateral in the setting of anatomic asymmetry. The diagnosis, clinically
- Lipodermatosclerosis, a fibrosing panniculitis of the subcutaneous tissue that can develop in the setting of chronic venous insufficiency following severe cases of deep venous thrombosis or associated with lymphatic compromise. The overlying skin is heavily pigmented and bound down to the subcutaneous tissues
- Lymphedema, abnormal accumulation of interstitial fluid resulting from injury/anatomic abnormality of the lymphatic system. The diagnosis, clinically

D.DX of Skin Abscess

- Epidermoid cyst – An epidermoid cyst is a skin-colored cutaneous nodule. The diagnosis is usually clinical, based on the clinical appearance of a discrete cyst or nodule, often with a central punctum, that is freely movable on palpation. Epidermoid cysts may become secondarily infected
- Folliculitis, inflammation of one or more hair follicles. The diagnosis, clinically; rarely, Gram stain and culture or skin biopsy may be warranted to differentiate folliculitis from other conditions.
- Hidradenitis suppurativa, a chronic suppurative process involving the skin and subcutaneous tissue of intertriginous skin. The diagnosis, clinically
- Nodular lymphangitis, presents as nodular subcutaneous swellings along the course of the lymphatic channels
- Myiasis, s an enlarging nodular mass associated with an insect bite; it is caused by penetration of fly larvae into subdermal tissue. The diagnosis is established via clinical manifestations in the setting of epidemiologic exposure to tropical and subtropical areas.

Dx/D.Dx

- The diagnosis of skin abscess, is based upon clinical manifestations
- Cultures should be obtained from skin abscesses
- Misdiagnosis of these entities is common, and possible alternative diagnoses should be considered carefully

Role of Imaging

- Ultrasound can be useful to determine whether skin abscess is present
- Imaging studies cannot reliably distinguish cellulitis from necrotizing fasciitis/gas gangrene; if there is clinical suspicion for these entities, imaging should not delay surgical intervention.

Preseptal Cellulitis
(Periorbital Cellulitis)

Introduction

- An infection of the anterior portion of the eyelid, not involving the orbit/other ocular structures
- Orbital cellulitis is an infection involving the contents of the orbit (fat and ocular muscles) but not the globe
- Preseptal cellulitis, a mild condition that rarely leads to serious complications, whereas orbital cellulitis may cause loss of vision and even loss of life
- Orbital cellulitis can usually be distinguished from preseptal cellulitis by its clinical features (ophthalmoplegia, pain with eye movements, impaired visual acuity, and proptosis) and by imaging studies
- In cases in which the distinction is not clear, clinicians should treat patients as though they have orbital cellulitis
- Both conditions are more common in children than in adults, and preseptal cellulitis is much more common than orbital cellulitis

PERISEPTAL CELLULITIS

ORBITAL CELLULITUS

- Preseptal cellulitis and orbital cellulitis involve different anatomic sites, with preseptal cellulitis referring to infections of the soft tissues anterior to the orbital septum and orbital cellulitis referring to infections posterior to it Neither infection involves the globe

- We prefer the term "preseptal cellulitis" to make a clear anatomic distinction between this infection and the more serious infection, "orbital cellulitis." Orbital cellulitis is sometimes referred to as "postseptal cellulitis"; we favor the term "orbital cellulitis,"

Anatomy

- The orbit is a cone-shaped structure, lying horizontally, with its apex in the skull
- It is surrounded by paranasal sinuses, namely, the frontal (lying superior), ethmoid (medial) and maxillary (inferior) sinuses
- The orbit is lined by periosteum. The ethmoid sinuses are separated from the orbit by a paper-thin layer called the lamina papyracea, which contains many perforations for nerves and blood vessels
- The most common route of infection to the orbit is by extension from the ethmoid sinuses, likely facilitated through these perforations
- The orbital septum is a membranous sheet that extends from the periosteum of the orbit to the tarsal plate and forms the anterior boundary of the orbital compartment As noted above, preseptal cellulitis involves the soft tissues anterior to the orbital septum

Epidemiology

- Preseptal cellulitis is much more common than orbital cellulitis
- Both infections are much more common in children than in adults
- It is important to distinguish between preseptal and orbital cellulitis because the complications, treatments, and outcomes of the two entities are very different

Pathogenesis

- Whereas the paranasal sinuses are the main source of infection in orbital cellulitis, a number of preseptal cellulitis cases arise from alternative sources.
- The most common cause of preseptal cellulitis may arise are the surrounding skin and soft tissues of the face and eyelids
- These tissues may become infected following bacteremia or local trauma [due to insect bites], animal bites or foreign bodies
- Acute dacryocystitis, sinusitis or upper respiratory tract infection, or trauma (including recent eyelid or strabismus surgery)
- Bacteremic seeding of the preseptal space was more common in the era before the availability of the conjugate vaccines for *Haemophilus influenzae* type b and *Streptococcus pneumoniae*
- *Pseudomonas aeruginosa* bacteremia is rarely associated with preseptal cellulitis in immunocompromised patients

Microbiology

- Infections arising from the sinuses/the nasopharynx, to be caused by *S. pneumoniae*, *Moraxella catarrhalis*, and *H. influenza*
- Local skin or skin structure infection (impetigo, cellulitis, or hordeolum)/dacryocystitis, the most common organisms are *Staphylococcus aureus* and *Streptococcus pyogenes*
- Routine immunization of children with the *H. influenzae* type b vaccine has caused a sharp decline in the incidence of this species as a cause of preseptal cellulitis
- Infrequent causes of preseptal cellulitis, *Acinetobacter* species, *Nocardia brasiliensis Bacillus anthracis*], *Pseudomonas aeruginosa* , *Neisseria gonorrhoeae* , *Proteus* spp , *Pasteurella multocida* , *Mycobacterium tuberculosis* , and *Trichophyton* spp (the cause of "ringworm"

Clinical Manifestations

- Preseptal cellulitis, with unilateral ocular pain, eyelid swelling, and erythema
- Chemosis (conjunctival swelling) may occasionally occur in severe cases of preseptal cellulitis ,uncommon
- Leukocytosis may also occur in patients with preseptal cellulitis, but is not a sensitive indicator of this infection
- The clinical manifestations of preseptal cellulitis should be distinguished from those of orbital cellulitis
- Serious complications are rare in preseptal cellulitis, eyelid necrosis and amblyopia associated with delayed resolution of periorbital swelling
- Sinusitis-related causes of preseptal and orbital cellulitis represent a continuum and that inappropriately treated preseptal cellulitis can progress to orbital cellulitis

Differential Diagnosis

The main clinical condition to distinguish from preseptal cellulitis is the more serious orbital cellulitis

- A local allergic reaction (to a topical ophthalmic antibiotic or to the sting of an insect) can also have a similar appearance to preseptal cellulitis but can usually be differentiated by the exposure history
- Blunt trauma to the eye may also cause eye swelling but the history should reveal the diagnosis.
- Periorbital swelling from environmental allergies, angioedema, or congestive heart failure is usually bilateral (in contrast to preseptal cellulitis, which is usually unilateral)

Other superficial periorbital processes are typically visually distinct from preseptal cellulitis

- Hordeolum (stye) and chalazion can be associated with eyelid inflammation, but are usually discrete nodular lesions '). Occasionally, an internal hordeolum points to the conjunctival surface of the eye and causes a diffuse rather than a localized swelling. Examination of the underside of the lid for the presence of a hordeolum helps distinguish this entity
- Conjunctivitis can rarely cause eyelid edema, but conjunctival findings (eg, injection and irritation) clearly distinguish this from preseptal cellulitis.

Diagnosis

- Preseptal cellulitis, a clinical diagnosis, made in a patient with eyelid swelling and erythema once orbital cellulitis has been excluded
- Exclusion of orbital cellulitis is dependent on the absence of proptosis, ophthalmoplegia, pain on eye movement, and impairment of visual acuity
- Rarely, imaging may be necessary in uncertain cases

Clinical Evaluation &Diagnosis

- Preseptal cellulitis is suspected in patients with unilateral eyelid swelling and erythema
- A history of recent sinusitis (or prolonged/worsening upper respiratory symptoms), insect bite, or local face and/or eyelid trauma is supportive of the diagnosis
- The most important aspect of the diagnostic evaluation is distinguishing preseptal cellulitis from the more severe orbital cellulitis , as these different infections have very different clinical implications

Orbital Cellulitis

- Findings that should raise concern for orbital rather than preseptal cellulitis include ophthalmoplegia with diplopia, pain with eye movement, visual impairment, and proptosis
- Orbital cellulitis causes swelling and inflammation of the extraocular muscles and fatty tissues within the orbit, but preseptal cellulitis does not
- Although chemosis can rarely occur in severe cases of preseptal cellulitis, it is more commonly suggestive of orbital cellulitis. The absence of fever suggests preseptal cellulitis, although patients with orbital cellulitis are sometimes afebrile
- In uncertain cases, CT scanning of the orbits and sinuses is used to distinguish preseptal cellulitis from orbital cellulitis.)
- If the distinction between the two remains uncertain following evaluation, patients should be managed as though they have orbital cellulitis

Laboratory Testing

- Is generally unnecessary for patients with preseptal cellulitis

- We suggest that blood cultures **not** be routinely performed, as the yield in this setting is extremely low
- Blood cultures are reasonable in very young patients, patients with fever, children who are unimmunized, and in cases in which the possibility of bacteremic preseptal cellulitis or orbital cellulitis cannot be reasonably excluded

Imaging Studies

- Contrast-enhanced CT scanning of the orbits and sinuses is helpful for distinguishing between preseptal and orbital cellulitis and is indicated if any clinical signs or symptoms point to orbital cellulitis rather than preseptal cellulitis
- CT imaging is also indicated in patients with presumed preseptal cellulitis who exhibit marked eyelid swelling, fever, and leukocytosis, or whose infection fails to show improvement after ٢٤ to ٤٨ hours of appropriate antibiotics
- Imaging findings of preseptal cellulitis demonstrate swelling of the eyelid(s) but no proptosis, no fat stranding of the orbital contents, and no edema of the extraocular muscles
- Sinusitis is a common cause of preseptal cellulitis and is present in most cases of orbital cellulitis; if sinusitis is identified, the possibility of orbital cellulitis must be given careful consideration

Management

- Adults and children older than one year of age with mild preseptal cellulitis can be managed on an outpatient basis, provided that the patient has no signs of systemic toxicity and close follow-up is ensured.

Hospitalization

- ✓ Children younger than one year of age
- ✓ Children who cannot cooperate fully for an examination
- ✓ Patients who are severely ill
- ✓ Patients with subtle clinical and/or radiographic findings suggesting that the orbit is involved
- ✓ Patients who fail to respond to initial outpatient therapy in ٢٤-٤٨ hours

Antibiotic Selection

- In patients with absence of skin trauma in the periorbital region, we suggest monotherapy with amoxicillin-clavulanic acid
- Alternatives include cefpodoxime, cefuroxime, cefdinir, and in cases of severe penicillin allergies, levofloxacin
- In patients with presence or recent history of skin trauma in the periorbital region, we suggest therapy with activity against *S. aureus* (including MRSA) and streptococci
- We use therapy with linezolid alone or TMP/SMX **plus** one of the following agents:amoxicillin-clavulanic acid, cefpodoxime, cefuroxime, or cefdinir

Duration of Therapy

- We generally administer antibiotics for five to seven days, but if signs of cellulitis persist at the end of this period, treatment should be continued until the erythema and swelling have resolved or nearly resolved.