Skin and Soft Tissue Infections: Update
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Outline
- General comments about approach to S&ST Infections
- Present Cases
- Incorporate proposed new guidelines

General Approach to S&ST Infections
- Location of infx may help define bacteriology
- Primary infx (breach of intact skin) usually monomicrobial; Secondary infx (pre-existing abnormality) often polymicrobial
- Impaired immunity - rapidly progressive (requiring early and aggressive Rx) and can be due to unusual organisms (procedures to define etiology more important)
- Environmental exposures
- Role of cultures

2012 IDSA UPDATE TO THE 2005 PRACTICE GUIDELINES FOR THE DIAGNOSIS AND MANAGEMENT OF SKIN AND SOFT-TISSUE INFECTIONS1
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Other Interesting Syndromes

- Nontuberculous mycobacteria ("Rapid Growers" M. fortuitum, chelonae-abscessus group) infections associated with nail salons and cosmetic surgery
- Pseudomonas "Hot-Foot Syndrome" assoc. with wading pools with abrasive grit on floor
- Aeromonas hydrophilia wound infections associated with mud football.
- "Hot Tub Lung" due to Mycobacterium avium complex in otherwise healthy individuals

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Role of Cultures

- Blood Cultures (Clin Infect Dis 1999;29:1483)
  - Low yield (1-2%), did not change therapy or outcome, expensive
- NEW RECOMMENDATIONS—BCs should be obtained & biopsy with culture considered:
  - Malignancy
  - Severe systemic sxhs (high fever/hypotension)
  - Unusual predisposing factors
    - Immersion injuries, animal bites, neutropenia and severe cell-mediated immunodeficiency

Masqueraders of Cellulitis

- Superficial and deep venous thrombosis
- Contact dermatitis
- Insect stings/tick bites
- Fixed drug eruptions
- Hidradenitis suppurativa
- Erythema nodosum
- Panniculitis
- Sweet syndrome
- Pyoderma Gangrenosum

Case

- 45 year olm man with minor trauma to leg
- Subsequently developed an ulcer treated with oral cephalosporins, but lesion progressed.
- Eventually admitted to the hospital for IV antibiotics—cultures negative—continued enlargement of lesion
- Taken to surgery 3 times to resect to clean margins—cultures negative or S. epidermidis—after each surgery lesion progressed
- Eventually transferred to UCSF
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Case Presentation

- A 66 year old woman with chronic LE edema secondary to CHF presents with the acute onset of a red, warm swollen and tender left foot. Erythema and tenderness extend to the mid-tibial area.
Etiology of Cellulitis

- **Outpatient** - Usually caused by *Strep, pyogenes* (*Gp A strep*), *S. aureus* and other *streptococcus* (*gp B,C,G*)
- **Hospital-associated** - may include *gram-negative organisms*, (E.coli, klebs, pseudomonas, enterobacter) as well as *staph* (including MRSA) and *streptococcus*
- **Decubitus/Diabetic/Vascular Ulcers** - polymicrobial including *staph, strep, enterococcus, enteric gram-negatives, pseudomonas, anaerobes*
- **Animal Bites** - *Pasteurella multocida* (<24hours), *staph, strep, enterococcus, gingeval strep*
- **Antibiotic considerations**

**Therapeutic Considerations**

- THE WAY IT WAS
  - Gp A strep + MSSA + dicloxacillin or cephalexin (Keflex®)
- THE WAY IT IS
  - Gp A strep + ?? MRSA

**Antibiotic Considerations same as Pasteurella multocida**
TMP-SMX (95-100%); doxy/minocycline (90-95%); clindamycin (60-70%) are active against CA-MRSA

- TMP-SMX and doxy/mino +/- against gp A strep
- If use these must add ß-lactam [PCN, Amox, 1st gen ceph (Keflex®)]
- Clinda active against gp A strep

**Therapeutic Considerations**

**GOAL**

- Convince you that:
  - Majority of cases of nonculturable cellulitis (without abscess, ulcers, drainage) are due to BHS or MSSA
  - AND
  - 1st generation cephalosporin (Keflex® or Cefazolin) is reasonable empiric therapy

**Study Design**

- Prospective evaluation of all patients presenting with diffuse, nonculturable cellulitis requiring admission to the hospital
- Measured antistreptolysin O (ASO) antibodies
  - Rise after infection with GAS, GCS and GGS
  - 98% of adults have titers < 170 IU/mL
- Anti-deoxyribonuclease-B (anti-DNase-B or ADB)
  - Rise after infection with GAS
  - 95% of adults have titers < 120 U/mL

**The Role of β-Hemolytic Streptococci in Causing Diffuse, Nonculturable Cellulitis**

_A Prospective Investigation_

Arthur Jung, MD, Marie Bohrski, MD, John Li, MD, and Ramosh Nathan, MD

_Medicine 2010;89:217-226_
Study Design

- Measure acute and convalescent (2-12 weeks) titers
- Exclusions:
  - Those with abscess, furuncle, ulcer
  - Those who received more than one dose of an antibiotic active against MRSA
- OUTCOME MEASURE:
  - Response to β-lactam antibiotics

Approach to Patient with Cellulitis

IDSA Guidelines

- For “typical” cases of cellulitis (nonculturable) use an antibiotic active against streptococci
- Many would include coverage for MSSA as well
- Treat for MRSA if there is drainage or an open wound (culturable), penetrating trauma or systemically ill
- Recommended duration is 5 days as long as improvement has occurred
  - Extend to 10 days if not improved in 5 days
- Elevation, interdigital toe exam to correct possible portals of entry
Case Presentation

A 56 year old diabetic presents with an ulcer on the metatarsal-phalangeal area of the plantar aspect of the foot. There is surrounding cellulitis with a necrotic base to the ulcer, but no purulent material can be expressed and bone is not showing. He has no F/C.

Bacteriology

(J Clin Microbiol 2007;45:2819)

- **S. AUREUS (including MRSA) + STOOL**
- On average 5 isolates per wound
- Aerobes–48%
  - S. aureus, streptococci, enterococci, enterobacteriaceae, pseudomonas
- Aerobes + Anaerobes
  - Bacteroides fragilis group
  - Prevotella
  - Porphyromonas
Therapy of Diabetic Foot Ulcers

- Mild infections direct therapy against GPC
  - Dicloxacillin, cephalaxin, clindamycin, Augmentin®
- If concern about MRSA
  - Add TMP-SMX or doxycycline
- Duration of therapy—1-2 weeks
- If fail therapy obtain cultures and base therapy on results
  - Tissue biopsy or curettage of the ulcer base

Lipsky et al CID 2012:54;132-173

Outcomes of Therapy - Diabetic Foot Infections

<table>
<thead>
<tr>
<th>Wound</th>
<th>Clindamycin (n=25)</th>
<th>Cephalexin (n=27)</th>
<th>Total (n=52)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healing</td>
<td>10 (40%)</td>
<td>9 (33%)</td>
<td>19 (37%)</td>
</tr>
<tr>
<td>Healed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved</td>
<td>14 (55%)</td>
<td>18 (67%)</td>
<td>32 (62%)</td>
</tr>
<tr>
<td>Unimproved</td>
<td>1 (4%)</td>
<td>0 (0%)</td>
<td>1 (2%)</td>
</tr>
</tbody>
</table>

Osteomyelitis

- Diagnosis
  - MRL—98% sensitivity and 89% specificity
  - Bone Biopsy—gold standard
    - Poor correlation between superficial cultures and bone biopsy
- Therapy
  - Based on culture
  - Duration—6 weeks—usually with surgery

Lipsky et al CID 2012:54;132-173

Adjunctive Therapy

- Growth factors
  - G-CSF (granulocyte), PDGF (platelet-derived), EGF (epidermal)
  - Insufficient data to support routine use
- HBO (Hyperbaric oxygen)
  - One small double-blinded study showed benefit (Eur J Vasc Endovasc Surg 2003;25:513)
  - Need more and larger controlled studies
  - If it is available (and you are a “believer”) it is used

Lipsky et al CID 2012:54;132-173
Cutaneous Staphylococcal Infections

- Folliculitis
- Furunculosis (boils)
- Carbuncles (coalescent boils)
- Skin abscesses
- Recurrent skin abscess

Infections of hair follicles

Folliculitis

Furuncle (Boil)
Furuncle or boil

Carbuncle

Cutaneous Staphylococcal Infections/Therapy per Guidelines

- Enhanced hygiene
- Warm compresses
- I&D
- ABXs if systemic Sxs

Skin Abscesses

- Involves dermis and deeper skin tissues
- Treatment: (per new guidelines)
  - I&D (Aspiration inferior)
  - Systemic antibiotics ONLY IF:
    - Impaired host defenses
    - Systemic symptoms
    - Difficult to drain areas (face, hand, genitalia)
    - Failure to improve with drainage alone
Recurrent Skin Abscesses

- Increasing frequency
- Most commonly due to MRSA—still see some MSSA
- Pathogenesis:
  - Nasopharyngeal colonization
  - Skin colonization (axilla, groin, perirectal)
  - Auto-inoculation
- Treatment—eradicate colonization

IDSA Recommendations for Treatment of Recurrent Abscesses

- Drain the abscess and culture
- Consider 5-10 days of treatment with an antibiotic**
- Consider a decolonization regimen of intranasal mupirocin and chlorhexidine washes and daily decontamination of personal items such as towels, sheets, and clothes**
- **weak recommendation with low quality of evidence
Emphasize personal hygiene

Decolonization may be considered if continued infections despite good hygiene

Nasal mupirocin twice daily for 5-10 days

Topical body decolonization with chlorhexidine or bleach baths for 5-14 days

Oral antimicrobial regimens may be considered if the above measures fail

*Poor evidence to support recommendation, based on opinions of experts

My personal approach

- TMP-SMX DS BID + Rifampin 300mg BID X 5 days-repeat every 6 weeks for 8 courses
- Chlorhexidine 2-3 X per week
- Personal Hygiene
- Clothes daily
- Towels Q 3 days
- Sheets Q week
- Vitamin C

A 25 y.o. previously healthy farm worker sustained trauma to his penis 2 days prior to admission. He presented to a local ED where he was found to have a small necrotic area on his penis that progressed while he was in the ED. He was given a dose of ceftriaxone and transferred to UCSF.

**Figure 2:** Actual skin necrosis and breakdown in a patient with associated central staph infection
Questions

- What is the diagnosis?
- What is the bacteriology?
- What is appropriate therapy?

FLESH EATING BACTERIA
**BACTERIOLOGY OF NECROTIZING FASCIITIS**

- **Type I**
  - Anaerobes (peptostreptococcus, bacteroides, anaerobic/microaerophilic streptococci)
  - Enteric gram-negative bacilli (E. coli, klebsiella, proteus, serrata, etc)
- **Type II** (hemolytic streptococcal gangrene)
  - Group A streptococcus + S. aureus

**Differential Diagnosis of Deep Tissue Infections**

- Progressive Bacterial Synergistic Gangrene
- Synergistic Necrotizing Cellulitis
- Gas Gangrene
- Necrotizing Cutaneous Mucormycosis
- Anaerobic Cellulitis
- Fournier's Gangrene

- Incubation Period
- Onset (gradual/acute)
- Pain/Swelling
- Exudate (Thin/Thick/Dark/SS/Purulent/Seropurulent/Dishwater)
- Gas
- Odor (Sour/Sweet)
Consider polymicrobial
- Broad spectrum antibiotics
  - Vancomycin or linezolid
  - Piperacillin-tazobactam or a carbapenem
- Surgery
- If Group A strep is the cause
  - Penicillin + clindamycin

High risk patient – diabetes, trauma, surgery
- Wound necrosis
- Gas
- Exudate (foul smelling)
- Systemic symptoms out of proportion to local findings
- Anesthesia of involved area

A 50 y/o faculty member
- 4 months prior
  - Cactus fell on hand
  - ED for removal of spines
  - Rx = Augmentin X 7 days
  - 3 months prior - pain in index finger
  - 3 weeks prior - pustule with drainage and nodular lymphangitis
  - No systemic symptoms and not immunocompromised
**QUESTION**

- What is the diagnosis?

<table>
<thead>
<tr>
<th>ORGANISM</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gp A streptococcus</td>
<td>Common</td>
</tr>
<tr>
<td>S. aureus</td>
<td>Occasional</td>
</tr>
<tr>
<td>Pasteurella multocida</td>
<td>Occasional</td>
</tr>
<tr>
<td>Spirillium minor</td>
<td>Rare</td>
</tr>
<tr>
<td>Filariasis</td>
<td>Rare</td>
</tr>
</tbody>
</table>

**CAUSES OF ACUTE LYMPHANGITIS**

**NODULAR LYMPHANGITIS**

- Common causes
  - Sporothrix schenckii
  - Nocardia (brasiliensis>asteroides)
  - Mycobacterium marinum
  - Francisella tularensis
  - Leishmania species
Less common causes
- Fungi: coccidioidomycosis, histoplasmosis, blastomycosis
- Mycobacteria: chelonae, kansasii, avium-intracellulare, tuberculosis
- Bacteria: S. aureus, gp A strep, Pseudomonas pseudomallei, Bacillus anthracis

Bacteriology can often be predicted by location of infection:
- Superficial infections usually GpA strep and S aureus
- Deep infections polymicrobial

History/Epidemiology can offer important clues to the diagnosis

Mimickers of cellulitis
- If not responding as expected think about biopsy

Take Home Points
- The etiology of cellulitis depends on the clinical scenario
- Outpatient cellulitis
  - Nonculturable/nonpurulent—Gp A strep & MSSA
  - Abscess/open wound—MRSA
- Diabetic foot ulcers are polymicrobial but only have to direct therapy to Gp A strep & MRSA

Recurrent skin abscesses (in my opinion) is best treated with an intermittent rifampin-based regimen
- Deep tissue infections are uncommon, but think of them if there is pain out of proportion to clinical findings
  - "A spider bite is NF until proven otherwise"
Caused by gp A strep (rarely gp B,C and G) and S. aureus

Disease of children (age 2-5) but can occur in adults

Predisposing factors include warm climate, crowding, poor hygiene

**Impetigo**
Impetigo - Therapy & Complications

- Per IDSA Recommendations
  - Antibiotics active against streptococci and MSSA
  - 1st generation cephalosporin (Keflex®), dicloxacillin, Augmentin®, clindamycin for penicillin-allergic patient
  - If fail to respond, culture
  - On rare occasions MRSA may be cause
  - Topical antibiotics (mupirocin) for localized disease
  - Non-suppurative complication—post-streptococcal GN
  - Antibiotics do not prevent GN
  - Rheumatic fever not reported

Erysipelas

- Caused by gp A strep (occasionally other gps)
- Bimodal distribution – infants/children and older adults
- Usually face and extremities, abdomen if assoc with surgery
- Painful, raised, erythematous, rapidly spreading lesion with well demarcated edges
- Systemic symptoms common
- Therapy same as non-culturable cellulitis
Infection of the submandibular space, usually associated with dental extraction. Caused by "oral flora" -- aerobic and anaerobic strep, fusobacterium, bacteroides spp. Acute onset with brawny, painful edema ("bull-neck appearance"), fever, elevation of tongue with drooling and dysphagia.
Ludwig’s Angina – Therapy

- Maintain airway
- Antibiotics - Unasyn® (ampicillin-sulbactam) or PCN + Flagyl® (metronidazole) or Clindamycin
- Surgery if abscess forms or fails to respond in several days