Severe Soft Tissue Infections

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UCSF Postgraduate Course in General Surgery
March 2012

Case Presentation

You are consulted by the medical hospitalist service to evaluate left lower extremity cellulitis.

62 year-old man with 3 days of left leg redness and severe pain. No antecedent trauma. No history of diabetes, peripheral vascular disease, or immunosuppression. The redness started on the calf and spread quickly. He came to the E.R. when the pain became severe. He was admitted and placed on vancomycin.

The cellulitis “seems like it isn’t getting any better”

T: 39.9  P 125  BP 95/57  R 32  spO₂: 91% on RA
CBC: 26 > 31 < 107  INR: 1.4
Na: 129  glucose: 187
Cr: 1.7  CRP: 207

photo courtesy of William Schecter, MD
Case Presentation

What is the best management option at this point?

1. Change antibiotics to clindamycin, elevate leg, and observe another 24 hours.
2. Obtain CT scan of the leg
3. Take to the operating room for debridement

You debride immediately in the operating room. Tissue cultures grow group A streptococcus pyogenes. Antibiotics changed to penicillin G + clindamycin. Patient intubated, monitored in ICU during SIRS response.

Serial debridements performed every 24h until infection eradicated.

After skin grafts ± free flap coverage of exposed bone / tendons.
Surgical Soft Tissue Infections

• **Necrotizing Cellulitis**
  - clostridial cellulitis
  - nonclostridial anaerobic cellulitis
  - Meleney’s synergistic gangrene

• **Necrotizing Fasciitis**
  - Type 1: mixed aerobic and anaerobic (includes Fournier’s)
  - Type 2: monomicrobial GAS or s. aureus

• **Clostridial myonecrosis (Gas Gangrene)**

• **Pyomyositis**

Necrotizing Cellulitis

**Clostridial cellulitis**
- most commonly caused from clostridium perfringens
- preceded by local trauma (puncture, stab)
- associated with gas in soft tissues (CT or XR to detect)
- variable systemic inflammatory response

**Nonclostridial anaerobic cellulitis**
- mixed infection of aerobic and anaerobic organisms
- produces foul odor
- usually occurs in diabetics
- similar in pathogenesis to Type 1 necrotizing fasciitis

Meleney’s synergistic gangrene

- slowly expanding indolent ulceration superficial to the fascia
- occurs in postoperative patient at surgical incision site
- caused from synergistic interaction between s. aureus and microaerophillic streptococci.

Necrotizing Fasciitis

**Type 1**
- mixed infection caused from aerobic and anaerobic bacteria
- occurs after surgical procedures, in diabetics, and in patients with peripheral vascular disease.
- when it occurs in the perineum, it is called Fournier’s gangrene
- treatment is debridement and ampicillin + clindamycin (or zosyn)

**Type 2**
- monomicrobial infection caused from streptococcus pyogenes Group A or methicillin resistant staph aureus
- dramatic increase in number of infections in 1990s
- 50% of patients also have Toxic Shock Syndrome
- Any age, can occur in healthy individuals
- Often no obvious portal of entry
- Treatment is debridement and high-dose PCN G + clindamycin (suppresses toxin formation, inhibits M-protein synthesis enhancing phagocytosis) and add vancomycin if MRSA suspected
Fournier’s Gangrene

Gas Gangrene

- Muscle infection from clostridium species from direct inoculation (puncture, trauma) or hematogenous seeding from GI tract
- Severe infection that sets up in devitalized, anaerobic environment and then spreads through healthy, vital muscle. Gas formation is ubiquitous.
- Clostridium produces alpha, theta toxins needed for virulence
- Marked systemic sepsis, shock, then multiorgan failure
- Severe pain at site of trauma
- Incubation short, less than 24-36 hours
- Death cause from sepsis and intravascular hemolysis. Overall mortality 20—40%
- Treatment is radical debridement and PCN G + clindamycin

Pyomyositis

- Purulent infection of muscle (unlike gas gangrene, where there is no pus) caused from hematogenous spread with abscess formation.
- Risk factors: immunodeficiency, trauma, IVDA, concurrent infection, malnutrition.
- Caused from s. aureus in 75-90% of cases. Group A strep is second most common organism.
- Signs and symptoms: fever and pain isolated to a single muscle group, which then progresses to marked pain, edema, and abscess formation.
- Imaging: CT scan
- Treatment: antibiotics and surgical drainage (percutaneous or open depending on abscess characteristics and location)

Does my patient have a necrotizing infection?

Host factors to consider:

- Diabetes, immunosuppression, obesity, PVD: (Type 1 infection)
- IVDA, Hep C, HIV: (MRSA)
- Recent trauma/puncture (clostridium)

Signs and Symptoms to look for:

- Unexplained pain, or pain out of proportion to exam findings
- Dark erythema with reddish-purple color
- Bullae and/or ulceration
- Crepitus (uncommon finding)
- Necrosis of skin
- Severe systemic toxicity
Does my patient have a surgical infection?

<table>
<thead>
<tr>
<th>Finding</th>
<th>Type 1 Nec Fasc</th>
<th>Type 2 Nec Fasc</th>
<th>Gas gangrene</th>
<th>Pyomyositis</th>
<th>Myositis</th>
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<tbody>
<tr>
<td>Fever</td>
<td>↑↑</td>
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<td>↑↑↑↑↑</td>
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<tr>
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<td>±</td>
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</tbody>
</table>

Stevens, 2012

Does my patient have a necrotizing infection?

The L.RINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) score: A tool for distinguishing necrotizing fasciitis from other soft tissue infections.

- Chin-Ho Wong, MD, MRCS; Lay-Wal Khint, MD, MSc; Kien Seng Heng, MD, FRCS;
  Khek-Chai Tan, MD, FRCS; Cheng-Quek Low, MD, FRCS

Predictive variables of necrotizing soft tissue infection were determined in a cohort of 314 patients with severe soft tissue infection, of whom 89 had necrotizing infection.

Predictor model was validated on another 140 patients admitted to a sister hospital with severe soft tissue infection, of whom 56 had necrotizing infection.

Does my patient have a necrotizing infection?

if score is 6 or more, evaluate deep tissues surgically
Does my patient have a necrotizing infection?

“Finger Test”: Andreasen 2001

At the bedside under local anesthesia, make a 1 inch incision in the skin, then dissect down to the fascia and muscle.

Healthy white fascia, pink muscle beneath = no necrotizing infection

Dishwater fluid along fascia, less adherence from fascia to overlying fat with blunt dissection = necrotizing infection

Muscle dead, doesn't contract = necrotizing infection