Necrotizing Fasciitis with Atypical Organisms from an Operating Room Floor

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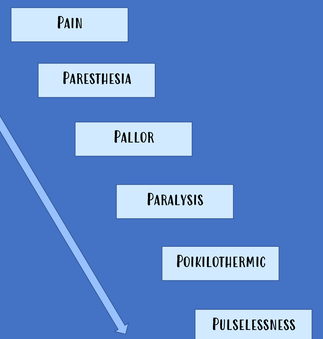
Introduction

- Necrotizing fasciitis (NF) is a type of soft tissue infection where muscle fascia & subcutaneous tissue are progressively destroyed[1]
- Early diagnosis is difficult because the overlying skin initially appears normal[1]
  - Definitive diagnosis of NF is achieved with surgical exploration[1]
  - A timely diagnosis is essential, because early debridement decreases mortality[2]
  - Two NF categories:
  - Monomicrobial- usually caused by Group A *Streptococcus*[2, 3]
  - Polymicrobial- typically *Bacteroides, Clostridium, Enterobacteriaceae*, *Streptococcus*[4]
    - common in patients with underlying comorbidities[4]

- Compartment syndrome: pressure within a tissue compartment increase and compromises the circulation of the enclosed tissues[2]
  - Most common etiology is a fracture[5]
  - Less common causes include soft tissue injury and vascular injury[5]
  - Can lead to amputation if diagnosis and management are delayed[2]

6 Ps of Compartment Syndrome[6]



Necrotizing Fasciitis Appearance Upon Presentation

Figure 1. Initial presentation of lower extremity necrotizing fasciitis

Figure 2. Necrotizing fasciitis post fasciotomy

Hospital Course

Initial Injury
- Blunt force injury with laceration
- ED: washed wound, sutured closed
- Started prophylactic TMP/SMX
- Discharged from ED

(7 days pass)

Hospital Day 1
- Returns to ED with severe pain
- CT shows abscess & features of soft tissue infection
- Broad spectrum antibiotics
- Surgery: fasciotomy, abscess drained, tissue debridement
- Admitted to hospital

Hospital Day 3
- Infection worsening- ↑purulent drainage & ↑pain
- Surgery: extended initial fasciotomy incision, 2 additional fasciotomies, washout, wound vac placed
- Cultures return: polymicrobial NF

Hospital Day 6
- Surgery:
  - wound washout
  - new wound vac placed
  - Closed the 2 small fasciotomies
  - Initial fasciotomy left open

Hospital Day 7
- Discharged home:
  - Oral antibiotics and antifungals
  - PT & wound care follow up arranged
- Initial fasciotomy left to heal through secondary intention

Case Description

History

- 35yo male hospital employee presented to emergency room complaining of worsening left lower leg pain
- History of workplace injury in the operating room 2 days prior: a Spider® limb positioner on the floor became projectile, hit his shin, and caused a laceration
  - Initial emergency room visit:
    - Wound washed with saline & betadine, closed with simple interrupted nylon sutures
    - Prescribed prophylactic trimethoprim/sulfamethoxazole (TMP/SMX) due to a history of a MRSA skin infection
- Returned to emergency room 2 days later:
  - Pain severity rated 10/10 → significantly worsened in the past 12 hours
  - Unable to dorsiflex his left ankle
  - Reported numbness and paresthesia in his medial left foot, including his first 2 toes
  - Denied fever, chills, shortness of breath, nausea

Past Medical History: MRSA skin infection, 2020
Past Surgical History: none
Medications & Allergies: none
Social History: denied smoking and recreational drug use. Remainder is unremarkable
ROS: unremarkable

Physical Exam

Vital Signs: BP 156/89mmHg, 98.2F, HR 83bpm, RR 20, SpO2 100% on room air
General: distressed, writhing in pain on stretcher. Alert and oriented x3
HEENT, heart and lung exams were benign
Extremities:
- 4cm dehisced longitudinal wound located on left anterior shin. 2 of the 4 original sutures were still in place. Mild serosanguinous discharge around the wound. No crepitus or fluctuance appreciated
- Left ankle dorsiflexion and plantarflexion 2/5. Flexion and extension of 1st & 2nd toes were 2/5 in strength. Passive range of motion limited by pain. Patient unable to perform active range of motion due to pain.
- Absent sensation of sharp and dull touch of left medial foot including 1st & 2nd toes
- Left dorsalis pedis and posterior tibialis pulses 1+. Capillary refill <2 seconds
- Right extremity exam was normal. No external wounds visualized, with appropriate strength and range of motion.

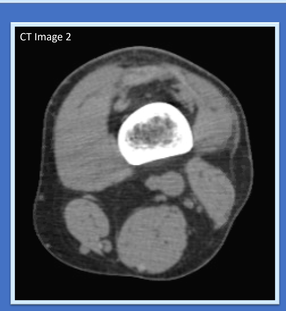
Differential

MRSA cellulitis
Compartment Syndrome
Osteomyelitis
Necrotizing fasciitis
Myositis

Diagnostic Studies

CBC & CMP unremarkable
WBC: 5.7
- Neutrophils: 79, Bands: 12, Lymphocytes: 7, Monocytes: 1, Myelocytes: 1

Radiograph of left lower extremity: no evidence of fracture
CT of left lower extremity: subcutaneous fluid, air and fat stranding. Air within deeper tissues, and fluid extending into the fascia. Consistent with findings of a pre-tibial abscess.
Blood cultures obtained: later grew *Alcaligenes faecalis, Brevundimonis*, *Cellulosimicrobium*



Treatment & Outcome

- General & orthopedic surgery consult →
  - Emergency left lower extremity fasciotomy with drainage of abscess
    - Tissue cultures obtained
    - IV vancomycin and cefepime
  - Admitted to hospital
- Hospital day 3: tissue cultures revealed: *Enterobacter cloacae, Citrobacter,* mold, *Strenoptrophomonas, Ochrobactrum species*, trichinella
  - Patient experienced worsening pain and increasing purulent discharge surrounding incision
  - Returned to OR for extension of his original incision, 2 additional fasciotomies, washout, debridement and wound vac placement
  - Infectious disease consulted →
    - IV vancomycin
    - IV voriconazole
    - Oral TMP/SMX
- Hospital day 6: wounds improving with less drainage; improved range of motion and strength
  - Returned to OR for washout, wound vac exchange and closure of his 2 small fasciotomies
  - Repeat blood cultures negative
- Hospital day 7:
  - Physical therapy reports left lower extremity strength improved to 3/5. Full active and passive range of motion
  - Deemed stable for discharge: prescribed PO doxycycline, TMP/SMX, and voriconazole
- Followed outpatient by wound care:
  - 3 weeks after discharge: reported wounds are healing well and the main large fasciotomy incision was about 50% closed

Discussion

- Many of the causative agents in this case are atypical of polymicrobial NF, and have rarely been studied in the context of soft tissue injuries[7-9]
- *Ochromactrum, Alcaligenes* and *Brevundimonas* species are commonly isolated from water sources and moist environments[7-9]. This suggests the operating room floor was a damp and contaminated environment

Bacteria Found in Blood
1. *Alcaligenes faecalis*
2. *Brevundimonis*
3. *Cellulosimicrobium*

Microbes Found in Tissue
1. *Enterobacter cloacae*
2. *Citrobacter freundii*
3. Mold
4. *Stenotrophomonas maltophilia*
5. *Ochrobactrum species*
6. *Alcaligenes faecalis*
7. Trichinella

Conclusion

- Necrotizing fasciitis is a rare cause of compartment syndrome, but it should be considered in a differential diagnosis
- Treatment for a patient with findings concerning for compartment syndrome is a fasciotomy
- Polymicrobial NF is rare in immunocompetent patients
- NF can be treated with aggressive surgical debridement and appropriate antibiotics. An infectious disease service should be consulted if possible

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