Necrotizing Fasciitis

Madhuri Rao, MD
June 27th, 2013
Case from Kings County Hospital Center
Case Presentation

• 31 yo F
• PMH: DM (type 1), CRI, verrucous elephantiasis of LE
• PSH: subxiphoid pericardial effusion drainage (March 2013)
• Meds: Nortriptyline, Aspart 5u AC, Lantus 20u qhs
• NKDA
• Social Hx: Denied IVDA, smoking, ETOH
Case Presentation

• Presenting complaint:
  o RUE swelling for 2 days
  o Pain, decreased ROM
  o Fever
  o Denied trauma, insect bites, infective skin lesions

• Examination
  o HR 66, BP 82/47, RR 20, O2 Sats 98%
  o Lethargic
  o CVS, RS, Abdomen – unremarkable
Case Presentation

• Examination (continued)
  o RUE – edematous from lower arm including hand
  o Dusky blue with blisters
  o Necrotic eschars on forearm and hand
  o Cool, dopplerable radial signal

• Labs
  o ABG – 7.3/23.5/135/99.4/15/-12.3
Case Presentation

• Preop Resuscitation
  o Fluid resuscitation
  o IV antibiotics – vancomycin, clindamycin
  o Insulin SC + drip

• OR Details
  o 3 areas of full-thickness skin necrosis debrided – dorsal and volar forearm, dorsum of hand
  o Necrotizing fasciitis of forearm extending past the elbow into mid-arm
  o Skin de-gloved
  o Extensive debridement
  o Viable muscle
Case Presentation

• Postop Course
  o Continued resuscitation in SICU
  o Ventilatory support
  o Antibiotics, insulin drip
  o Wound care – bedside debridement and washout

• Postop Day 3
  o Return to OR for further debridement
  o Necrotic muscle and fascia – debrided
  o Complete debridement of necrotic skin
  o Transferred back to ICU
Case Presentation

• Postop Day 4 – 5
  o Worsening clinical condition – ARDS, septic shock
  o Return to OR for further debridement - progressive muscle and soft tissue necrosis
  o Limb deemed not viable
  o Too unstable for procedure

• Postop Day 5 – 6
  o Physiological/cryoamputation initiated
  o Continued resuscitation
  o Off pressors, decreased vent requirement
Case Presentation

• Postop Day 7
  o Transhumeral amputation

• Current Status
  o Improved respiratory and circulatory status
  o Extubated
  o Resolving sepsis
  o Wound vac on stump
  o Awaiting definitive procedure vs. closure
Discussion

Definition
Clinical Significance
History
Terminology
Microbiology
Clinical Features
Diagnosis
Management
Prognosis
Definition

• Spreading infection of deeper soft tissues

• Progressive destruction of fascia and overlying s/c fat

• Muscle sparing (early)
Clinical Significance

• 3.5 Cases per 100,000 persons/yr

• 24 -34 % mortality rate

• Early, accurate diagnosis

• Early surgical intervention
History

• Joseph Jones – 1871
  o Hospital gangrene
  o Reported mortality 46%

• Wilson - 1950
  o Coined term “necrotizing fasciitis”
Terminology

- Necrotizing Soft Tissue Infections

  - Cellulitis
  - Necrotizing fasciitis
  - Myositis

- Site specific names
  - Fournier’s gangrene
  - Ludwig’s angina
Classification/Microbiology

Type 1
- Polymicrobial
- Common
- Immunocompromised – DM, CRF
- GPC – Staph., Strep.
- GNR - E. coli, Pseudomonas
- Anaerobes – Bacteroides, Clostridium

Type 2
- Monomicrobial
- Less common
- Healthy individuals
- Triggered by trauma
- Grp. A beta-hemolytic Strep. – “Flesh eating bacteria”
- MRSA
- a/w Toxic shock syndrome
Risk Factors

- Diabetes
- Immunosuppressants
- Malnutrition
- Age > 60 yrs
- IV drug use

- Peripheral vascular disease
- Renal failure
- Underlying malignancy
- Obesity
Progression

- Hyperacute vs. Subacute
  - Stage 1
    - Woody edema
    - Pain
    - Leucocytosis, bandemia
  - Stage 2
    - Systemic sepsis
    - Rapidly spreading infection despite antibx
    - Septic vasculitis/thrombosis
    - Skin- dusky blue gray, blisters
    - ARF, hyponatremia, metabolic acidosis
Progression

• Hyperacute vs. Subacute
  o Stage 3
    Dish water pus
    Hemorrhagic bullae
    Bacteria along fascia - inflammed, thrombosed vessels - necrotic eschars
    Numbness
    Systemic sepsis
### Diagnosis

<table>
<thead>
<tr>
<th>Skin</th>
<th>Pain</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erythema with ill-defined margins</td>
<td>Pain that extends past margin of apparent infection</td>
<td>Fever with toxic appearance</td>
</tr>
<tr>
<td>Tense edema with grayish or brown discharge</td>
<td>Severe pain that appears disproportionate to physical findings</td>
<td>Altered mental state</td>
</tr>
<tr>
<td>Lack of lymphangitis or lymphadenopathy</td>
<td>Decreased pain or anesthesia at apparent site of infection</td>
<td>Tachycardia</td>
</tr>
<tr>
<td>Vesicles or bullae, hemorrhagic bullae</td>
<td></td>
<td>Tachypnea due to acidosis</td>
</tr>
<tr>
<td>Necrosis</td>
<td></td>
<td>Presentation with DKA or HHNK</td>
</tr>
<tr>
<td>Crepitus</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data from Seal, Green et al, Headley, Hsiao et al, Elliot et al, and Dufel and Martino.
## Diagnosis – Lab Adjuncts

**Laboratory risk indicator for NF:** $5 = \text{low risk} (<50\% \text{ probability})$; $6-7 = \text{intermediate risk} (50\%-75\% \text{ probability})$; $>8 = \text{high risk} (>75\% \text{ probability})$.

<table>
<thead>
<tr>
<th>INVESTIGATION</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum C-reactive protein = 150 mg/L</td>
<td>4 points</td>
</tr>
<tr>
<td>White blood cell count</td>
<td></td>
</tr>
<tr>
<td>• 15000/µL – 25000/µL</td>
<td>1 point</td>
</tr>
<tr>
<td>• &gt; 25000/µL</td>
<td>2 points</td>
</tr>
<tr>
<td>Hemoglobin</td>
<td></td>
</tr>
<tr>
<td>• 11.0-13.5 g/dL</td>
<td>1 point</td>
</tr>
<tr>
<td>• &lt; 11 g/dL</td>
<td>2 points</td>
</tr>
<tr>
<td>Serum sodium &lt; 135 mEq/L</td>
<td>2 points</td>
</tr>
<tr>
<td>Serum creatinine &gt; 1.6 mg/dL (141 mmol/L)</td>
<td>2 points</td>
</tr>
<tr>
<td>Serum glucose &gt; 180 mg/dL (10 mmol/L)</td>
<td>1 point</td>
</tr>
</tbody>
</table>

---

Data from Anaya and Dellinger and Wong et al.
Diagnosis

- Surgical exploration
  - Definitive
  - Fascial necrosis
  - Loss of fascial integrity
  - Muscle involvement – late stage

- Plain X-ray

- CT-scan
  - Sensitivity 80%

- MRI
  - Sensitivity 100%
  - Specificity 86%

Clinical suspicion trumps all other criteria
Treatment

Principles of treatment
  o Early Accurate diagnosis
  o Source control
  o Management of systemic sepsis
  o Early aggressive operative debridement
  o Broad spectrum antibx
Treatment-Surgical Debridement

- Exploration, wide debridement, drainage
- Underestimated on physical exam
- Excise all necrotic tissue- fat, fascia, muscle
- Finger test
- Re-evaluate in 24-48 hrs
- Daily exploration under GA until pt toxic, any remnant necrotic tissue
Physiological amputation

• Tourniquet above the affected site

• Freeze the affected extremity

• Aim
  o Control local infection
  o Limit cytokine release/circulation
  o Allow for medical stabilization
Current Role of Cryoamputation
Winburn GB et al., Am. J. Surg. 1991, Department of Surgery, Medical College of Georgia, Augusta

- 320 physiological amputations over 30 yrs
- Same rate of mortality as primary amputation (11%)
- Decreased need for amputation revision (9% vs. 17%)
Physiological amputation


- 56 pts over 12yrs
- 14% mortality
- DM poor prognosis predictor
Antibiotics

• Gram stain by aspiration/ tissue fluid culture

• Broad spectrum
  o Carbapenem/B lactam + Clindamycin + MRSA coverage
  o Aminoglycoside/Fluoroquinolone + Metronidazole

• Tailor to culture
  o GAS- Penicillin + Clindamycin
Antibiotics

• IVIG
  - In type 2 NF with strep toxic shock syndrome

• HBOT- unclear data

Supportive Care

• Early goal directed therapy for sepsis

• Correct dehydration

• Adequate oxygenation

• Treatment of underlying diseases (e.g., correction of ketoacidosis, congestive heart failure)

• Nutritional support
Prognosis


- 472 pts

- Mortality
  - Overall - 12%
  - 30 day - 11%

- Eight independent predictors
  - Liver cirrhosis
  - Aeromonas infection
  - Band PMNs > 10%
  - Bacteremia
  - Soft tissue air
  - Age older than 60 years
  - aPTT > 60 secs
  - Serum creatinine > 2 mg/dL
Prognosis

Predictors of Mortality and Limb Loss in Necrotizing Soft Tissue Infections, ARCH SURG/VOL 140, FEB 2005 Anaya et al.

• Retrospective cohort study

• 166 pts

• Overall mortality 16.4 %

• Limb loss 26 %
Prognosis

• Predictors of mortality
  o WBC > 30000 x10^3/μL
  o Creatinine level >2 mg/dL
  o Heart disease at hospital admission

• Predictors of limb loss
  o Clostridial infection
  o Heart disease
  o SBP<90 mm Hg on admission
  o IV drug users
Summary

- Necrotizing fasciitis, a rapidly spreading an life-threatening condition
- Diagnosis based on clinical suspicion
- Early accurate diagnosis
- Early aggressive surgical debridement
- Supportive care
- Consider physiological/cryoamputation for unstable patient
- Poor prognosis
References


**Schwartz's Principles of Surgery, Ninth Edition.** F Brunicardi et al.

**Predictors of Mortality and Limb Loss in Necrotizing Soft Tissue Infections.** ARCH SURG/VOL 140, FEB 2005 Anaya et al.


**Current Role of Cryoamputation.** Winburn GB et al., Am. J. Surg. 1991, Department of Surgery, Medical College of Georgia, Augusta.
Thank You