Not Every Oyster Has a Pearl: A Case Study of Vibrio Vulnificus
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The warm waters of the Gulf of Mexico and the surrounding waterways are a desirable destination for many locals and tourists. However, what may be lurking in the water could affect at risk individuals if proper precautions are not taken.

Case Vignette

The patient is a 55 y/o male who presented to the ED with a chief complaint of “left lower extremity pain.”

- The onset of pain is approximately one day ago. It is described initially as a “dull ache” which has progressed to an “intense pressure and burning sensation” over the past 4 hours. He rates the pain initially as a 10/10.
- One day prior to the onset, he was boating and swimming in the brackish water of the Alabama Gulf coast.
- He reports that the pain is worsened with walking, standing, and touch.
- The pain is alleviated with extremity elevation, heat application, and ibuprofen.
- Additional symptoms include the following:
  - LLE swelling, redness, and heat; fever, N/V, malaise, and rigors developed the night before presentation.
Subjective Data

PAST MEDICAL & SURGICAL HISTORY:
- Chicken Pox (age unknown)
- Hypertension
- BLE venous stasis
- Denies: DVT, Cellulitis, Phlebitis, or hx of other vascular problems

HOME MEDICATIONS:
- Losartan/HCTZ 50/12.5mg po daily
- Atenolol 25mg po daily
- Aspirin 325mg po daily
- MVI 1 tablet po daily

ALERGIES:
- Denies food, medication, or environmental allergies

SOCIAL HISTORY:
- Drinks a 5th of Bourbon every 2 days and 2 cans of beer daily
- Denies tobacco or illicit drug use

FAMILY HISTORY:
- Non-contributory to the chief complaint

REVIEW OF SYSTEMS:
- Positive for fever, rigors, malaise, N/V; LLE pain with swelling, redness, and warmth
- Denies SOB, CP, palpitations

Physical Examination

VS: T 103.2 P 132 R 30 BP 60/32 SaO2 82% on RA

CONSTITUTIONAL:
- Ill appearing, obese male in acute distress

INTEGUMENT:
- Mucous membranes warm, pink, & dry. Well demarcated area of warmth, erythema, and bullae noted to the LLE from the mid-calf area to the distal

THORAX/LUNGS:
- Respirations regular, even, and labored at 30 breaths per minute. Lungs clear to auscultation in all fields bilaterally.

CARDIOVASCULAR:
- Tachycardic RRR, S1 S2 auscultated without murmurs, rubs, or clicks. Peripheral pulses are weak

ABDOMEN/GI:
- Soft, non-distended, non-tender. Bowel sounds hypoactive.

NEUROLOGIC:
- Drowsy, oriented to person, place, time & situation. Answers questions appropriately

LYMPHATIC:
- Inguinal & popliteal lymph nodes non-palpable

Initial Management

Upon arrival to the ED, the patient was hypotensive, hyperthermic, & hypoxic.

The following initial management strategies were performed:

- High-flow O2 via non-rebreather → SaO2 96%
- Aggressive IVF replacement → BP 106/60mmHg
- Dilaudid 2mg IV for pain
- Acetaminophen 1 gram po for fever
Pertinent Lab Results

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
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<tbody>
<tr>
<td>WBC</td>
<td>17 x 10,000 µL</td>
</tr>
<tr>
<td>Hgb</td>
<td>12.7 g/dL</td>
</tr>
<tr>
<td>Na</td>
<td>132 mEq/L</td>
</tr>
<tr>
<td>Glucose</td>
<td>147 mg/dL</td>
</tr>
<tr>
<td>Creatinine</td>
<td>2.4 mg/dL</td>
</tr>
<tr>
<td>CRP</td>
<td>160 mg/dL</td>
</tr>
<tr>
<td>Arterial pH</td>
<td>7.21</td>
</tr>
<tr>
<td>Lactic acid</td>
<td>4.9 mmol/L</td>
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<tr>
<td>CK</td>
<td>1,460 U/L</td>
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Pertinent Diagnostic Data

- Non-contrast CT of the LLE revealed:
  - Anterior and lateral soft tissue swelling
  - Soft tissue gas
  - Fluid collections across fascial planes
- BLE Venous Doppler neg for DVT
- Portable CXR neg for acute cardiopulmonary processes

Preliminary Bullous Fluid Gram Stain

Gram negative, motile, curved rods
“culture pending”
Presumptive Diagnosis

Based upon the patients' history & physical exam findings in conjunction with lab, diagnostic, & gram stain results, the presumptive diagnosis is:

Necrotizing Fasciitis secondary to
V. Vulnificus infection

Necrotizing Fasciitis

- Infection of the deep soft tissues that commonly spreads along fascial planes
- Progressive destruction of the subcutaneous fat layer and muscular fascia
- Most commonly due to Streptococcus spp.

Epidemiology

- Affects M & F equally
- More common in older adults
- Incidence: 4.8 people/100,000 per year
- Mortality rate is ≈35%

Classification of Necrotizing Fasciitis Variants

<table>
<thead>
<tr>
<th>Type</th>
<th>Microorganism</th>
<th>Risk Factors</th>
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<tbody>
<tr>
<td>I</td>
<td>Polymicrobial bacterial (Streptococcus spp. and Bacteroides most common)</td>
<td>Chronic disease states such as diabetes and hepatic failure; immunocompromised; peripheral-vascular disease</td>
</tr>
<tr>
<td>II</td>
<td>Monomicrobial bacterial (MRSA and GAS most common)</td>
<td>MRSA: intravenous drug use; GAS: surgery, minor trauma in healthy individuals</td>
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<tr>
<td>III</td>
<td>Vibrio vulnificus</td>
<td>Exposure to brackish or seawater, especially with an open wound</td>
</tr>
<tr>
<td>IV</td>
<td>Fungi</td>
<td>Immunocompromised states, especially end-stage acquired immunodeficiency syndrome</td>
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The initial insult occurs when a break in the skin is exposed to contaminated water. Bacterial toxins and enzymes break down superficial tissues. The inflammatory process produces additional fascial destruction. The bacteria, toxins, and enzymes spread rapidly across the fascial planes. Thrombosis, ischemia, & tissue liquefaction occurs enhancing tissue destruction.

**Vibrio Vulnificus** is a gram-negative rod that is commonly found in warm, brackish waters near the Gulf of Mexico.

**Modes of Transmission**

1. Exposure to contaminated seafood via the GI tract
2. Exposure to contaminated seawater via a break in the skin

Susceptible Individuals are those with:

- Chronic liver disease, cirrhosis
- Peripheral vascular disease
- Immunocompromised state
- End-stage renal disease
- Open wounds
- Diabetes
- Hereditary hemochromatosis
Microbiology

- Produces powerful siderophores which scavenge iron from host transferrin and lactoferrin
- Highly motile with a single flagella
- Grow in both aerobic and anaerobic environments
- Ideal water temp is 68°-95°
- Encapsulated and resistant to innate phagocytosis
- Considered a moderate "halophile", which is a salt requiring organism

V. Vulnificus Epidemiology

- Vibroisis cases YTD as of August 2019
  - Florida: 110
  - Texas: 61
  - Alabama: 19
  - Louisiana: 3
  - Mississippi: 2
- There were 38 reported cases in Alabama in 2018
- Florida averages ≈31.8 cases per year with V. vulnificus accounting for the majority
- Results in ≈80,000 illnesses, 500 hospital visits, and 100 deaths per year in the US
- The #1 cause of shellfish associated deaths in the US
- May-October are the most susceptible times

Emergent Specialty Consultations

An interdisciplinary approach to care is recommended with V. Vulnificus

Intensive: Patients with sepsis type symptoms should be admitted to the ICU for advanced care.

Infectious Disease: Recommended for patients with complicated cellulitis and suspected V. Vulnificus infection.

General & Orthopedic Surgery: Urgent surgical consultation is indicated in rapidly evolving necrotizing fasciitis in addition to monitoring for the development of compartment syndrome.
Empiric Antibiotics

**Ceftazidime 1 gm Q 12h:** Ceftazidime is one of the antibiotics of choice in the treatment of V. Vulnificus. It is gram negative specific and provides a broad-spectrum coverage while awaiting culture confirmation.

**Doxycycline 100mg IV BID:** Doxycycline is the second antibiotic of choice in the treatment of V. Vulnificus in combination with Ceftazidime.

**Vancomycin 1 gm IV Daily:** Vancomycin is utilized to cover for MRSA while final blood and fluid cultures are pending.

Patient Outcomes

**Admission Day 1:**
The patient underwent emergent surgical wound exploration with debridement of a large area of tissue from the LLE at which time tissue cultures were collected and sent for analysis.

**Day 2:**
The patient continued to deteriorate. The initial erythema & crepitus was noted to have spread to the proximal thigh and hip. He underwent emergent amputation of the LLE.

**Day 3:**
The patient developed ARDS for which he required intubation & mechanical ventilation.

Despite aggressive medical and nursing management, the patient did not survive.

This case illustrates an aggressive presentation of NF, however the symptoms may be highly variable
Diagnosis

- The "typical" clinical manifestations are present in less than half of patients.
- Gold Standard: Open surgical evaluation with tissue/fluid cultures.
- Laboratory testing:
  - CBC
  - CMP
  - Blood Cultures
- Diagnostic Testing:
  - CT
  - MRI
  - US

Common Diagnostic Abnormalities

- Leukocytosis with a left shift
- Elevated BUN and creatinine
- Elevated creatinine kinase
- Thrombocytopenia
- Elevated fibrin split products
- Gram negative curved rods on Gram stain
- Positive cutaneous lesion and blood cultures for V. Vulnificus
- CT or MRI of the affected area often demonstrates soft tissue swelling or gas production if severe.

Laboratory Risk Indicator for Necrotizing Fasciitis (LRINC) Scoring Tool

- Utilized to differentiate NF from more benign STI's.
- A score of ≥6 should raise suspicion.
- A score of >8 is highly predictive.

*The patient presented in this case had a LRINC = 10.
Differential Diagnosis of Necrotizing Fasciitis

- Cellulitis
- Erysipelas
- Abscess
- Deep Vein Thrombosis (DVT)
- Pyoderma Gangrenosum
- Gas Gangrene
- Pyomyositis

Management

- **Rapid surgical debridement within 24h** is first line therapy and should not be delayed due to imaging
- **Serial debridement** may be required
- **Fasciotomy** may be required for the development of compartment syndrome
- **Amputation** may be necessary in severe cases involving extremities

- **Adjunct broad-spectrum antibiotics**
  - Initial agents should encompass activity against gram negatives, gram positives, & anaerobes while cultures are pending
  - Empiric coverage for a causative organism should be provided
  - Once culture data is available, antibiotics should be tailored to the gram stain & culture results

- **Tailored antibiotics should be continued until the following are met:**
  - Completion of all surgical debridement
  - Hemodynamic stability
  - Afebrile for at least 48h

- **Supportive care**
  - Fluid resuscitation
  - Vasopressors

Complications & Prognosis

- The most common complication of *V. vulnificus* is septicemia which progresses to septic shock
- Patients who develop necrotizing fasciitis and require amputation are at high risk for death within the first week of admission
- The mortality rate is 50% for most patients, however it can reach 100% in patients with severe immunocompromised states
- Additional indicators of poor prognosis:
  - Persistent hypotension with SBP < 90mmHg
  - Thrombocytopenia
  - Leukopenia
  - Pre-existing DM or hepatic dysfunction
Closing Points

- NF is a rapidly progressing bacterial infection of the ST, fascia, and muscle
- If unrecognized, NF can lead to sepsis, MODS, and death
- The initial diagnosis is based on clinical findings with supportive lab and diagnostic imaging
- A thorough history and clinical exam is essential for rapid diagnosis
- At risk patients who have been swimming at the Gulf coast should have a high index of suspicion for V. Vulnificus as the causative organism

References


