Necrotizing Soft Tissue Infection

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Injury/Disease Demographics

- Although relatively rare in the general population, necrotizing soft tissue infections are seen more often in:
    - Morbidly obese patients
    - Diabetics
    - Alcoholics
    - Injectable drug users

Clinical Presentation

- Symptoms and physical findings may include:
    - Malaise
    - Fever or chills
    - Hyperglycemia
    - Pain at sight of infection
    - Soft tissue edema
    - Elevated C-reactive protein (CRP) >200 mg/L
    - Elevated white blood cell (WBC) count with left shift
    - Hyponatremia
- Late findings may include:
    - Hypotension
    - Encephalopathy/altered mental status
    - Acidosis
    - Anuria or oliguria
    - Skin bullae or necrosis
    - Physical exam may show a cellulitic wound with a central necrotic focus, or simply rapidly progressive cellulitis.

Evaluation/Diagnostics/Imaging

- Plain radiograph may show subcutaneous or sub-fascial air.
- Historically, wound aspiration was used to obtain fluid for gram stain. This is no longer routinely done.
- CT scanning may be done in questionable cases; it will show subcutaneous or sub-fascial air as well as inflammation and edema. In cases of obvious necrotizing soft tissue infection, the patient should be in the OR not the CT scanner.
- Surgical exploration may be both diagnostic and therapeutic showing “dirty dishwater” type fluid along the fascia. Also may show ischemic or necrotic subcutaneous fat with thrombosed small veins.

Role of Conservative Management and Associated Considerations

- There is **no role for conservative management** in necrotizing soft tissue infection.

- If it is thought that the patient has bad cellulitis (based on LRINEC score <6 and no soft tissue gas) and not a necrotizing soft tissue infection, a trial of broad spectrum antibiotics may be initiated and the wound evaluated on an hourly basis for regression of cellulitis. The boarders of the cellulitis should be marked with a permanent marker, and timed, dated and initialed. In all instances, if the cellulitis does not show rapid improvement, the patient should rapidly proceed to the OR for exploration/debridement.
- Hyperbaric oxygen therapy has been used as an adjunct for the treatment of necrotizing soft tissue infection with varying results. The mainstay of treatment remains surgical.

Indications for Operative Intervention – any of the finding below are indications for operation

- "Cellulitis" not responding to broad spectrum antibiotics.
- LRINEC score > 6.
    - LRINEC Scale
        - CRP
            - <150mg/L – 0 points
            - ≥150mg/L – 2 points
        - WBC
            - <15K – 0 points
            - 15-25K – 1 point
            - >25K – 2 points
        - Hemoglobin
            - >13.5 g/dL – 0 points
            - 11-13.5 g/dL – 1 point
            - <11 g/dL – 2 points
        - Sodium
            - ≥135 mEq/L – 0 points
            - <135 mEq/L – 2 points
        - Creatinine
            - ≤1.6 mg/dL – 0 points
            - >1.6 mg/dL – 2 points
        - Glucose
            - ≤180 mg/dL – 0 points
            - >180 mg/dL – 2 points
- Gas in soft tissues.
- Clinical deterioration.
- Operative debridement should NEVER be delayed for hyperbaric oxygen therapy.

Pre-operative Preparation

- Patients should be started on broad-spectrum antibiotics prior to going to the OR.
- Fluid resuscitation should begin in the ED if patients are in shock.
- Foley catheter should be placed to monitor resuscitation.

- Broad skin prep should be accomplished as large surface areas may need to be debrided.
- Patients should be typed and crossed in anticipation of transfusion when necessary.
- Consent should include multiple debridements and include possible amputation if extremities are involved. If there is perineal involvement, fecal diversion may be necessary. Additionally, preoperative involvement of the GU team may be warranted for testicular/scrotal involvement of the infection.

Operative Techniques/Intraoperative Considerations

- Once general anesthesia is established, patients should be widely prepped and draped.
- Debridement should start centrally and continue until ALL necrotic tissue is removed.
- Samples of wound fluid and necrotic tissue should be sent for gram stain and culture.
- Wounds should be dressed with wet to dry dressings with local antimicrobial properties such as dilute betadine, or Dakins solution.
- Guillotine amputation may be necessary to control spread of infection.

Postoperative Management/Complications

- All patients should be returned to the OR in 24 hours for a second look and repeat debridement as necessary.
- Patients should be returned to the OR every 24 hours until all necrotic tissue is removed and the wound looks clean at final takeback.
- Postoperative broad-spectrum antibiotics should be continued until gram stain results show a single or polymicrobial source of infection.
- Antibiotics should then be tailored to the organism cultured based on resistance, and continued until the infection is eradicated(usually 10-14 days).
- Wound coverage often requires late skin grafting.
- Dermal substitutes, or local rotational or free flap coverage may be required for exposed bone or tendons.

Considerations for Special Populations

- In cases of late diagnosis of overwhelming necrotizing soft tissue infection in severely debilitated individuals, discussion of the use of comfort care may be warranted.

Suggested Readings

- Wong CH, Khin LW, Heng KS, Tan KC, Low CO. The LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) score: a tool for distinguishing necrotizing fasciitis from other soft tissue infections. Crit Care Med. 2004; 32(7):1535–1541.

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- Ray-Zack MD, Hernandez MC, Younis M, Hoch WB, Soukup DS, Haddad NN, Zielinski MD. Validation of the American Association for the Surgery of Trauma emergency general surgery grade for skin and soft tissue infection. *J Trauma Acute Care Surg*. 2018 Jun;84(6):939-945

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