

Morbidity & Mortality Conference
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**Necrotizing
Fasciitis and Soft-
Tissue Infections**

Necrotizing Fasciitis

- Deep seated infection of subcutaneous tissues resulting in progressive destruction of fascia, muscle, and fat
 - Type I
 - Mixed infection with aerobic and anaerobic bacteria
 - Most common in pts with DM and PVD, after surgical procedures
 - Type II
 - Group A streptococcus (GAS, *Streptococcus pyogenes*)
 - Spontaneous gangrenous myositis considered separately

Type I

- Caused by penetrating or blunt trauma and IVDA; common in DM, immunocompromised pts
- Predominant isolates: E. coli, Streptococci, Enterococci, S. aureus, Peptostreptococcus species, Bacteroides fragilis, and Clostridium species
- Average of 4.6 isolates per specimen

Type II

- “Streptococcal gangrene”, dramatic increase in 1990s
- Immunocompromised pts, penetrating or blunt trauma, IVDA, chickenpox, surgical procedures, childbirth
- Hematogenous translocation of GAS from pharyngitis or trauma
- Alternative hypothesis: GAS dormant in deep tissues and reactivated by trauma



Bisno AL, Stevens DL. N Engl J Med 1996; 334:240-245



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Streptococcal Necrotizing Myositis

- “Spontaneous gangrenous myositis”, high mortality (80-100%)
- Fever, pain, board-like induration of affected muscle
- Most pts otherwise healthy, DM and HIV do not increase risk
- No gas on X-ray

Streptococcal Toxic Shock Syndrome

- Constitutional symptoms, bacteremia, hemolysis, hypotension, septic shock, ARDS, ARF, MOF, coma, death
- Entry thru skin, vagina, pharynx, or unknown source
- GAS virulence factor: antiphagocytic M protein
- High mortality (30-60%)

Pyomyositis

- Common in tropics; affects thigh, calf, and gluteals
- *S. aureus* predominant, but Streptococcus, Yersinia, Klebsiella, Pasteurella, Enterobacter, Clostridium, mycobacteria, and Candida have been reported
- Neutropenia or qualitative defects of neutrophil function predispose to pyomyositis
- Tx: antibiotics, percutaneous or open drainage

Clostridial Soft Tissue Infections

- Contamination → anaerobic cellulitis → myonecrosis
- Traumatic, recurrent, or spontaneous types
- Invasion of healthy muscle
- Virulence factors: α -toxin and θ -toxin
- Rapid advance to hypotension, ARF (RTN), sepsis, and MOF

Diagnosis

- ↑ WBC, ↑ CK, ↑ myoglobins
- X-ray, CT, or MRI helpful but should not delay prompt surgical exploration
- Clinical features allow distinction among necrotizing fasciitis, gas gangrene, pyomyositis, but surgical exploration often the final determinate

Differential Diagnosis

	Type I	Type II	Gas Gangrene	Pyomyositis
Agent	Polymicrobial	GAS	Clostridium species	S. aureus
Fever	++	++++	+++	++
Pain	++	++++	++++	++
Systemic toxicity	++	++++	++++	+
Tissue gas	++	-	++++	-
Predisposing factors	DM, immune compromise	±	-	-

Cultures

- Blood cultures positive in 20% of pts with Type I, and 60% of pts with type II necrotizing fasciitis
- Not completely reliable
- Skin or bullae aspiration may be positive but unreliable
- Awaiting results of cultures prior to surgical exploration and antibiotic coverage discouraged

Treatment

- Early and aggressive surgical exploration and debridement of all necrotic tissue
- Broad-spectrum antibiotic therapy
- Hemodynamic and respiratory support
- Best indication for surgical intervention is severe pain, fever, and toxicity, with or without radiographic findings

Surgery

- Initial goals of surgery:
 1. establish diagnosis
 2. perform aggressive surgical debridement of all involved tissues
- Re-exploration should be performed in 24 hrs
- Repeat explorations and debridement may be necessary on daily basis
 - ***Cervical necrotizing fasciitis*** — expedited management essential due to proximity to vital structures
 - ***Fournier's gangrene*** — surgical emergency, may require cystostomy, colostomy, or orchiectomy

Antibiotic Therapy

- Broad-spectrum coverage
- Ampicillin or ampicillin-sulbactam (Unasyn) combined with clindamycin or metronidazole
- G(-) coverage necessary if pt recently hospitalized: ticarcillin-clavulanate (Timentin) or piperacillin-tazobactam (Zosyn), or add fluoroquinolone, aminoglycoside, 3rd generation cephalosporin, or carbapenem
- GAS infection: clindamycin, penicillin ineffective due to inoculum effect

Intravenous Immune Globulin (IVIG)

- Neutralization of circulating clostridial toxins and streptococcal antigens
- Retrospective analysis and case reports show possible reduction in mortality
- May be effective adjunctive therapy for streptococcal toxic shock syndrome

Hyperbaric Oxygen

- Augments neutrophil bactericidal activity, kills strict anaerobes, inhibits growth of facultative anaerobes, limits clostridial exotoxin and spore production
- Improved outcomes in experimental models of gas gangrene and observational studies of necrotizing fasciitis
- High cost, barotrauma, tympanic membrane rupture

Riseman JA, Zamboni WA, Curtis A, et al. Surgery 1990; 108:847-50

Tibbles, PM, Edelsberg, JS. N Engl J Med 1996; 334:1642-1648

Mortality

- Type I: ~20%, type II: ~30-35%
 - Admission to surgery time > 24 hr independent predictor of mortality after controlling for age, sex, DM, and hypotension
 - Amputation does not affect mortality
- Cervical necrotizing fasciitis: ~20%
- Fournier's gangrene: ~20-40%

Conclusions

- Fulminant nature of soft-tissue infections require prompt recognition and treatment
- Early and frequent surgical debridement and wound treatment
- Antibiotic coverage tailored over time