

necrotising fasciitis & other rapidly progressive skin & soft tissue infections
[created by Paul Young; 03/10/07]

pathology

- The histological hallmark is extensive inflammation and necrosis of the subcutaneous fat, fascia, and muscle.

- Extensive surgical debridement (fasciotomy) is the mainstay of effective treatment.

- Antimicrobial therapy is directed toward the results of the initial Gram's staining and culturing of aspirate. Initial broad-spectrum therapy with a b-lactam/ b lactamase inhibitor and clindamycin
- There is evidence to suggest that clindamycin, a protein synthesis inhibitor, suppresses toxin production by streptococci, making it a necessary component of initial antibiotic therapy, until cultures and sensitivities are available.
- In nosocomial infections where MRSA is prevalent or in cases with serious penicillin allergy, empiric therapy with vancomycin and clindamycin would be considered.

- Hyperbaric oxygen therapy remains controversial; however, if available, it may be a beneficial adjunct for a subset of patients with anaerobic gram-negative necrotizing fasciitis.

- Intravenous immunoglobulin (IVIg) has been useful in uncontrolled reports for patients with severe group A streptococcal necrotizing fasciitis.

Empirical therapy

- For empirical therapy, where the diagnosis is uncertain and until tissue and blood culture results are available, use initially:
meropenem 1 g (child: 25 mg/kg up to 1 g) IV, 8-hourly
PLUS EITHER
clindamycin 600 mg (child: 15 mg/kg up to 600 mg) IV, 8-hourly
OR
lincomycin 600 mg (child: 15 mg/kg up to 600 mg) IV, 8-hourly.
- Penicillin is commonly added but is theoretically unnecessary.
- Consider the use of immunoglobulin if Streptococcus pyogenes necrotizing fasciitis is suspected.

Streptococcus pyogenes necrotising fasciitis

- For Streptococcus pyogenes necrotising fasciitis, in addition to surgical debridement, use:
benzylpenicillin 1.8 g (child: 45 mg/kg up to 1.8 g) IV, 4-hourly
PLUS EITHER
clindamycin 600 mg (child: 15 mg/kg up to 600 mg) IV, 8-hourly
OR
lincomycin 600 mg (child: 15 mg/kg up to 600 mg) IV, 8-hourly
PLUS (consider after expert advice)
immunoglobulin 0.4 to 2 g/kg IV, for 1 or 2 doses during the first 72 hours.
- For patients hypersensitive to penicillin (excluding immediate hypersensitivity), substitute for benzylpenicillin:
cephalothin 2 g (child: 50 mg/kg up to 2 g) IV, 6-hourly
OR
cephazolin 2 g (child: 50 mg/kg up to 2 g) IV, 8-hourly.

Polymicrobial necrotising fasciitis and synergistic gangrene

- Synergistic gangrene is so-called because it is polymicrobial and the organisms are thought to act synergistically. The term Fournier's gangrene is used for synergistic gangrene of the genitalia, usually following spread from a perianal, retroperitoneal or urinary tract infection, or following genital trauma (eg postpartum).
- For synergistic gangrene and for polymicrobial necrotising fasciitis, in addition to surgical debridement, use:
meropenem 1 g (child: 25 mg/kg up to 1 g) IV, 8-hourly.
- Modify therapy according to culture and susceptibility results.

Clostridial infection

- Clostridial infection varies from mild cellulitis to overwhelming myonecrosis (gas gangrene). The basis of treatment is surgical debridement of necrotic tissue, resuscitation and antibiotic therapy.
- In severe infections, hyperbaric oxygen should be considered if available.
- The diagnosis of gas gangrene is a clinical one. Neither the isolation of clostridia nor the presence of gas in tissue is diagnostic of the condition.
- For clostridial infection with or without myositis/myonecrosis (gas gangrene), use:
benzylpenicillin 2.4 g (child: 60 mg/kg up to 2.4 g) IV, 4-hourly.
- For patients with immediate penicillin hypersensitivity, use:
metronidazole 500 mg (child: 12.5 mg/kg up to 500 mg) IV, 8-hourly.

causative organisms

- These infections can be caused by:
 1. monomicrobial pathogens including:
 - (i) streptococci especially Streptococcus pyogenes (approximately 10% are caused by group A streptococcus alone)
 - (ii) Clostridium perfringens (gas gangrene) and other clostridial species,
 - (iii) Staphylococcus aureus,
 - (iv) Vibrio vulnificus and other Vibrio species,
 - (v) Aeromonas hydrophila
 2. polymicrobial synergistic gangrene involves:
 - (i) mixed aerobic-anaerobic bacterial flora (eg Escherichia coli, Bacteroides fragilis, streptococci and staphylococci).

risk factors

- Underlying comorbidities that may predispose to necrotizing fasciitis include diabetes mellitus, alcohol abuse, peripheral vascular disease, renal failure, odontogenic infection, and malignancy; it may complicate chicken pox.
- Group A streptococcal necrotizing fasciitis, however, often occurs in young, previously healthy patients. This is postulated to be due to the absence of previous exposure to these more virulent strains of bacteria, as an absence of protective antibody appears to predispose persons to infection
- Penetrating and crush injuries are particularly likely to cause these infections (chicken pox) in children and adults.

clinical features

- Necrotizing fasciitis often begins with pain deceptively out of proportion to any skin findings.
- The clinical presentation changes to an exquisitely tender, swollen area of extensive soft tissue erythema
- The disease progresses at an alarming rate, with skin changing from a shiny red-purple to a pathognomonic gray-blue with ill-defined patches often within 36 hours after onset.
- Necrosis of the superficial fascia and fat produces a thin, watery, malodorous fluid. The area may later become anesthetic as cutaneous nerves are destroyed. A hard, wooden feel of the subcutaneous tissues may be present.
- Crepitance has been noted in approximately 30% and is associated with polymicrobial infections, including Enterobacteriaceae and Clostridium.
- Patients can become extremely toxic, with high fever, anxiety, altered mental status, leukocytosis, shock, and tachycardia.
- The most common primary site is an extremity, although necrotizing fasciitis can affect any body part.
- When present in the perineum and genitalia, it is known as Fournier's gangrene, which is due to infection with group A streptococci or mixed infection with enteric bacilli and anaerobes.
- This entity originates from the scrotum and rapidly progresses to the perineum and anterior abdominal wall. The testes are spared from necrosis because of their separate blood supply. Urethral obstruction can occur from excessive penile edema.

infective causes of soft tissue crepitus

Cellulitis	Usually anaerobic organisms, clostridial and non-clostridial
Bursitis	Gram-negative organisms
Necrotizing fasciitis	Usually type I (mixed infections, Gram-negative organisms)
Myonecrosis	Clostridial organisms
Infected vascular gangrene	Any organism

prognosis

- Mortality rates range from 20% to 40%.
- Higher mortality rates are found in people with diabetes, malnutrition, obesity, arteriosclerosis, and advancing age.
- In addition, delay in diagnosis and treatment and infections with invasive group A streptococcus are associated with higher mortality rates.