

Necrotizing Fasciitis

Risk

- Incidence in USA: Approximately 9–11.5 cases of invasive streptococcal infections, from which 1–1.8 die each year
- STSS and NF, each comprising an average of 6–7% of these invasive cases, with an associated mortality of 35–50% for STSS and 29% for NF
- Predisposing risk factors: Diabetes, peripheral vascular disease, alcoholism, IV drug abuse, immunosuppression, obesity, or malnourishment

Perioperative Risks

- Shock, hypoperfusion, organ dysfunction, and hyperglycemia or hypoglycemia
- MODS and death

Worry About

- Making an early diagnosis and beginning treatment (which always includes surgical debridement) accordingly, which is the single most important factor to decrease morbidity and mortality
- STSS and septic shock

- Multiple organ dysfunction, including pulmonary (ARDS), renal, hepatic failure, and hematologic (DIC)
- Postop ICU often required

Overview

- NF constitutes one of the two severe manifestations of GAS, along with STSS, and often is associated with it during its initial presentation.
- NF is a common cause of CV collapse, shock, and hypoperfusion, which could be aggravated by the anesthetics. High suspicion is important to ensure early detection and treatment of hypovolemia and hypoperfusion. A suitable anesthetic procedure should be planned. Aggressive and continuous assessment of the CV status is required to have a stable hemodynamic state during sepsis.
- Despite the low incidence of the disease, prompt recognition is important given its devastating consequences, not only as a major cause of mortality but also morbidity, including
 - Organ failure with long-term requirement of support therapy (i.e., dialysis, home O₂)

- Physical disfigurement and amputations causing physical and psychological disability
- Acute and chronic pain syndromes (difficult to control)

Etiology

- Polymicrobial (including *Staphylococcus aureus*, *Escherichia coli*, enterobacteria, *Clostridium* spp., *Peptostreptococcus*, *Fusobacterium*, and *Bacteroides* spp.) in 70% of cases; GAS, which is causal in 30% of cases
- Skin and soft-tissue infections (majority of cases at 80%) and contaminations from distant sources (bacteremia) (20% of cases)

Usual Treatment

- Early diagnosis and repeated surgical excision of necrotic tissues are often required.
- Adequate antibiotic coverage is based on cultures and sensitivities.
- Support of organ systems, metabolism, and nutrition are necessary.
- Hyperbaric O₂ therapy is still under study.

Assessment Points

System	Effect	Assessment by Hx	Physical Examination	Test
CV	Vasodilation, hypovolemia early after local symptoms (i.e., 24–48 h)	Dizziness, alteration in mental status	Signs of dehydration, orthostatism, tachycardia, hypotension	Hemodynamic monitoring
HEME	DIC, hemorrhage, leukocytosis	Petechiae, skin discoloration	Bleeding, poor coagulation, fever, chills, myalgias	Hgb and Hct, clotting evaluation with platelets, PT/PTT, fibrinogen, fibrin split products, CBC
RENAL	Prerenal and acute renal failure	UO	Signs of hypovolemia	Urinalysis with specific gravity, Na excretion, serum creatinine and BUN
PULM	ALI/ARDS	None	Hypoxia, increased work of breathing	ABG with low P/F ratios <300
DERM/SOFT TISSUE	Inflammation, necrosis, blistering	Hx of skin/soft-tissue injury (i.e., insect bite, contusion, ingrown nail)	Pain, erythema, edema, cellulitis with rapid progression to bluish discoloration, blisters, subcutaneous crepitus	Congelation biopsy, with fascia involvement.

Key References: Hakkarainen TW, Kopari NM, Pham TN, et al.: Necrotizing soft tissue infections: review and current concepts in treatment, systems of care, and outcomes, *Curr Probl Surg* 51(8):344–362, 2014; Durrani MA, Mansfield JF: Anesthetic implications of cervicofacial necrotizing fasciitis, *J Clin Anesth* 15(5):378–381, 2003.

Perioperative Implications

Preoperative Preparation

- Establish large-bore venous access promptly and optimize CV status and perfusion. Anticipate additional fluid loss from exposed debrided areas and large fluid shifts.
- Note type and cross.
- Consider ketamine 1–2 mg/kg versus etomidate 0.2 mg/kg as induction agent. Watch for CV depression during induction. Anticipate the potential for adrenal insufficiency with etomidate.
- Provide adequate pain control.
- Consider procedure contaminated and use all recommended infection control guidelines.

Monitoring

- Establish invasive CV monitoring (CVC and A-line), PPWF, echocardiography, and temperature monitor.
- Clotting studies, CBC, and chemistry-7.
- Pulm airway pressures, tidal volumes, and ABGs.
- Perfusion to end organs: ScvO₂/SvO₂, lactate, and base excess.

Preinduction/Induction

- Hydrate aggressively with crystalloids/colloids.
- Establish invasive CV monitoring (CVC and A-line). Preoxygenate adequately.
- Aspiration prophylaxis.
- Do not delay antibiotics.

Maintenance

- Monitor volume status (CVP/SVV/PPWF/UO) and perfusion adequacy to optimize accordingly, including volume responsiveness; consider requirement of vasopressors (such as norepinephrine).

- Monitor blood loss, coagulopathy, and electrolyte imbalance and replace accordingly.
- Avoid hypothermia; monitor for fever.
- Watch for the presentation of bacteremia during/after debridement (hypotension, tachycardia, and fever).
- Consider delaying extubation according to CV/pulm status.
- RA: Do not use in the acute setting. Only use it in the absence of shock, occult shock, hemorrhage, and significant coagulopathy. Usually adequate in later stages of the disease while still requiring surgical management.
- Spinal versus epidural: Use is dependent on affected region and length of the procedure.
- Anticipate important loss of sympathetic tone in the setting of potential hypovolemia.
- Do not use if anesthetic application implies puncture through potentially contaminated site.

Postoperative Period

- Potential requirement for continued intubation to maintain adequate oxygenation and to be admitted to ICU
- Must be directed at obtaining adequate end-organ perfusion (establish invasive CV monitoring [CVC and arterial line], PPWF, ECHO [volume status and cardiac contractility]; obtain ABG, ScvO₂/SvO₂, lactate, and base excess)
- Optimize support according to pt requirements (i.e., CVVH, HD, and mechanical ventilation)

Anticipated Problems/Concerns

- Pts are often in septic shock, hypovolemic, or hypoperfused to begin with. Optimize CV and perfusion status in preinduction and be cautious during induction. Always consider associated comorbidities.
- Surgical debridement, combined with antibiotic therapy, is the only strategy to decrease poor outcomes. Do not delay surgical intervention. Surgical procedures may include amputation of limbs, which if delayed may cause uncontrolled systemic involvement and response.
- Complications such as organ failure (acute kidney injury 80% or ARDS 50%) and bacteremia (60%) are the rule, not the exception. Be prepared to support failing organs and troubleshoot acute destabilizations.
- Pts may require additional surgical interventions such as diverting colostomies or urinary diversions to avoid further contamination.
- Specific complications may arise depending on the location of NF.