CLINICAL QUIZ

Approach to Necrotizing Fasciitis

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CASE 1. RISK FACTORS
A 45 year old man presents to the emergency department with a two hour history of pain and erythema over the dorsal surface of his right hand. His medical history is significant for diabetes mellitus, peripheral vascular disease, rheumatoid arthritis, hypertension, and smoking. His medications include an ACE-inhibitor and NSAID as well as insulin and low-dose prednisone.

In the following case, all of the following are risk factors for developing necrotizing fasciitis except:

A) Diabetes mellitus
B) Peripheral vascular disease
C) Hypertension
D) Smoking
E) Immunosuppression

CASE 2. CLINICAL PRESENTATION
A 53 year old man presents for the second time to the emergency department with a two day history of worsening right thigh pain and erythema. He was previously diagnosed with cellulitis but left against medical advice without receiving intravenous antibiotics. On examination he has a temperature of 38.6°C and demonstrates marked tenderness in the affected area.

What are the clinical features of necrotizing fasciitis in the early stages?

A) Pain/tenderness beyond the margins of erythema
B) Subcutaneous emphysema
C) Swelling/edema
D) Cutaneous anesthesia
E) Violaceous bullae
CASE 3. DISEASE CLASSIFICATION
A 57 year old female develops necrotizing fasciitis of the left leg. On palpation, the left thigh is extremely tender and demonstrates subcutaneous emphysema/crepitus. Radiographs (see above) reveal extensive subcutaneous gas extending into the muscular planes of the thigh and distally beyond the knee.

What type of necrotizing fasciitis does the patient have?

A) Type I (polymicrobial)
B) Type II (monomicrobial Gram-positive organisms)
C) Type III (gram-negative monomicrobial infection, usually Vibrio spp.)
D) Type IV (fungal organisms)

CASE 4. TREATMENT
A 66 year old female on hemodialysis is consulted to the plastic surgery service after admission to the ICU because of septic shock syndrome. A diagnosis of necrotizing fasciitis is made and treatment is immediately initiated. During surgery, a volar and posterior fasciotomy is performed displaying necrotic muscles and marked amounts of pus, extending to the deltopectoral groove and pectoralis major muscle.

Which of the following are mainstay treatments for necrotizing fasciitis?

A) Early surgical debridement
B) Hyperbaric oxygen therapy
C) Broad spectrum antibiotics
D) Intravenous immunoglobulin therapy
E) Supportive measures (intravenous fluids, oxygen, etc.)
F) Intravenous steroids
CASE 5. DRESSING CARE

A 37 year old male is diagnosed with necrotizing fasciitis of the right leg on the medicine ward. Intravenous fluids, ceftriaxone, and vancomycin are immediately initiated, and orthopaedic surgery is consulted. During surgical exploration, the finger test is positive and necrotic tissues extending from the knee to ankle are debrided. The surgical incisions are left open, with exposure of the popliteal artery, vein, and nerve superiorly, as well as the tibialis posterior and calcaneal tendons inferiorly.

How should the wounds be dressed?

A) The wounds should be covered with wet to dry dressings
B) The exposed anatomical structures should be covered by providone-iodine-soaked gauze
C) The exposed neurovascular structures should be covered by topical antibiotics
D) Vacuum-assisted closure should be used over the exposed anatomical structures

CASE 6. MORTALITY

A 47 year old female is diagnosed with necrotizing fasciitis in the emergency department. Her vitals are as follows: temperature 39.1°C, heart rate 105, respiratory rate 22, and blood pressure 105/60. On examination, she has a 17 x 10 cm area of mottled skin which is tender and swollen. The patient has difficulty extending her knee. Initial blood work reveals a lactate of 4.2 and a white blood cell count of 16.8.

Given this patient’s clinical condition, what is the mortality rate of necrotizing fasciitis?

A) 100%
B) 70%
C) 25%
D) 5%
CLINICAL QUIZ ANSWERS

CASE 1:
C) HYPERTENSION

The risk factors for necrotizing fasciitis include diabetes mellitus, peripheral vascular disease, intravenous drug use, smoking, immunosuppression, varicella infection, alcohol use, renal failure, malnutrition and the use of non-steroidal anti-inflammatory drugs.1,2

Precipitating events include traumatic injuries, surgery, soft tissue infection, minor invasive procedures (e.g. joint aspirations, acupuncture), burns, intravenous drug use, childbirth and penetrating injuries (e.g. insect and animal bites).2

CASE 2:
A) PAIN/TENDERNESS BEYOND THE MARGINS OF ERYTHEMA AND C) SWELLING/EDEMA

The early clinical features of necrotizing fasciitis include erythema, pain/tenderness beyond the margins of erythema, and swelling/edema.3 Other non-specific features include warmth, induration, fluctuance, and fevers/chills.

Subcutaneous emphysema, violaceous bullae, and cutaneous anesthesia are relatively later findings. Other late findings include skin necrosis, dusky blue discolouration, as well as altered mental status and features of sepsis.1

CASE 3:
A) TYPE I (POLYMICROBIAL)

Necrotizing fasciitis is classified into four types based on the microbiologic etiology.

Type I is polymicrobial and results from a synergistic mixture of anaerobic, aerobic and facultatively anaerobic bacteria. This is the most common type.

Type II is usually monomicrobial and due to Gram-positive organisms, most frequently by group A streptococcus alone or occasionally with Staphylococcus Aureus. This may be associated with toxic shock syndrome.

Type III is a gram-negative monomicrobial infection (usually Vibrio spp.).

Type IV is caused by fungal organisms such as candida.4

Gas in the subcutaneous tissues is most often caused by Clostridium perfringens, a Gram-positive, rod-shaped, anaerobic, spore-forming bacterium (seen on the radiographs above; AP view).

CASE 4:
A) EARLY SURGICAL DEBRIDEMENT C) BROAD SPECTRUM ANTIBIOTICS E) SUPPORTIVE MEASURES

Mainstay treatments involve early surgical debridement of infected and necrotic tissue, broad spectrum antibiotics against anaerobes and Gram-negative and Gram-positive bacteria (commonly penicillin, clindamycin and a fluoroquinolone or an aminoglycoside) and supportive measures as needed (adequate oxygenation, fluid and blood resuscitation, attention to nutritional requirements, optimization of the patient’s comorbidities). Surgical debridement may need to be repeated and secondary reconstruction is usually required. Amputation or decompressive fasciotomy may be necessary for necrotizing infections of the extremities.
which may be life saving.\textsuperscript{5}

The use and efficacy of intravenous immunoglobulin and hyperbaric oxygen therapy remain controversial.\textsuperscript{3}

**CASE 5:**

**A) WET TO DRY DRESSINGS SHOULD BE USED**

The wounds should be left open and covered with wet to dry dressings with or without a layer of non-adherent gauze. Exposed anatomical structures should be covered with saline-soaked gauze or other hydrating dressings to prevent desiccation. Silver sulfadiazine is a broad-spectrum topical antibiotic that may also be used on exposed tendons to prevent desiccation. The use of providone-iodine and chlorhexidine is generally reserved for skin preparation prior to a procedure. Vacuum-assisted closure or negative pressure wound therapy should not be used directly over exposed neurovascular structures due to the risk of bleeding or injury.

**CASE 6:**

**B) 70%**

Necrotizing fasciitis is an infection of the superficial fascia, subcutaneous tissues and deep fascia with the potential to spread rapidly and cause tissue or muscle necrosis. It has a mortality rate of 25\%, and this rate increases to up to 70\% in patients who develop sepsis.\textsuperscript{1}

Complications which contribute to mortality during the recovery period include acute renal failure, acute respiratory distress syndrome, bacteremia, and other infections (e.g. pneumonia, urinary tract infection, etc.).\textsuperscript{6}

**REFERENCES**