Abstract:

Necrotizing fasciitis is a potentially limb threatening and life threatening infection that is being recognized with increasing frequency in persons with diabetes mellitus in the USA and abroad. Satisfactory outcomes can be achieved with early diagnosis and aggressive surgical therapy in concert with empirical antimicrobial therapy. We present such a case in a diabetic patient who also had a history of prior liver transplantation, Although he suffered an above knee amputation in the control of the infection, his survival was due to early aggressive management once the diagnosis had been established.

Key words: Diabetes mellitus, necrotizing fasciitis, Above the knee amputation.

Introduction

Necrotizing Fasciitis (NF) is a rare infection involving the superficial and deep fascial layers of the extremities, abdomen, or perineum. The disease often results in both loss of limb and loss of life with a high incidence of morbidity and mortality.\(^3,5\) Mortality in several studies has ranged from 25\% to 60\% with limb amputations as high as 39\%.\(^3,4\) NF can be broken in to 2 subcategories based on infection level. Type 1 is a polymicrobial infection caused by a variety of organisms including facultative anaerobes, anaerobes and streptococci other than group A. Type 2 NF is caused by the bacteria Beta-Hemolytic group A streptococci by itself or in combination with \textit{Staphylococcus aureus} or \textit{Staphylococcus epidermidis}.\(^4,7\) In addition, NF may also be classified by the portal of entry, either by a known wound, or idiopathic with no visible portal of entry.\(^3\)

The presentation of NF can vary depending on the location, duration of infection and immune status of the patient. Typical signs and symptoms include pronounced pain (alldynia), crepitus, watery discharge, edema, skin blistering and cellulitis.\(^5\) Additional clinical signs include gas on x-ray, bullae, skin necrosis, and thickening of the subcutaneous tissue with high fluid collections on MRI.\(^6\) The infection is rapidly spreading and often appears less than 1 week after the initiating event.\(^6,7\)
Several predisposing factors may also contribute to, or make a patient more susceptible to NF. IV drug abuse, diabetes mellitus, chronic liver disease, type of infection (MRSA, Polymicrobial, Strep A), hypertension, ischemia and immunosuppressed state can all lead to higher morbidity and mortality. Delayed recognition and lack of surgical treatment were also found to contribute to loss of limb or life. Diabetes was found to be the major predisposing factor in adults in several studies. Diabetes was also shown to be present in up to 64% of patients suffering from NF.

Recent data has suggested additional factors may contribute to mortality in NF. Aragon-Sanchez et al reported direct correlation between age over 75 years, creatinine over 132.5 micro mol/L and retinopathy were all predictive factors in loss of limb and loss of life.

Another study reported presence of crepitus, septic shock, multiple organ dysfunction, and pulmonary embolism as significant risk factors for mortality. Interestingly, the presence of osteomyelitis was not associated with limb loss or greater mortality.

We herein report a rather severe case of NF in a diabetic patient to highlight the importance of early, aggressive management in controlling this potentially life threatening complication.

**Case Report**

Our patient is a 57 year-old diabetic male who presented to the emergency department at the Carl T. Hayden VA in Phoenix on 3/21/09 complaining of a painful, swollen right ankle. He related a history of tripping and spraining the ankle 3 days previously. The ankle became increasingly painful over the subsequent 3 days to the point where he could no longer bear weight on the right extremity. He also stated he had a blister develop after the injury, which he lanced and drained himself.

His past medical history was significant for type 2 diabetes mellitus, hepatitis C, previous ulcerations of the lower extremity and a liver transplant 15 years previously. The patient was on chronic tacrolimus therapy to prevent liver rejection.

On initial examination, the right ankle had marked edema and ecchymosis over the lateral surface of the leg. His capillary fill time was less than 3 seconds, dorsalis pedis pulse was palpable and patient was able to move all digits. Some hemorrhagic bullae were noted at medial aspect of the foot and leg, as well as a 3cm x 2cm lateral foot wound. The lateral ankle was extremely tender to palpation. A mild cellulitis was present from the distal foot to the level of the ankle.

On initial examination he was found to be pyrexic with an elevated temperature of 100.9 degrees Fahrenheit. His initial WBC was 25.5 with a left shift at 93.8% granulocytes. His creatinine was elevated at 4.13 gm/dL. All other lab values were within normal limits.

The patient was admitted for cellulitis and severe ankle pain. He was placed on intravenous Vancomycin, Ciprofloxacin and Piperacillin/tazobactam. Deep venous thrombosis (DVT) was ruled out by ultrasound examination. The patient began to experience increased pain and numbness in his foot, and some concern was raised over possible compartment syndrome. There was no evidence on x-ray of gas, but mild soft tissue edema was noted. (Fig. 1A) A CT scan was performed and showed discrete hypodensities in the muscle of the anterolateral and posterior compartments of the leg. (Fig. 1B)

He was transferred to the surgical intensive care unit on 3/24/09 where compartment pressures were obtained. Compartment pressure measured 21mmHg in the lateral compartment and deep posterior compartments of the leg. Pulses were non-palpable with a monophasic dorsalis pedis pulse and a non-audible posterior tibial pulse on Doppler.
Figure 1 Initial x-ray of foot. (A) CT scan of lower leg showing increased edema, and muscular hypodensities. (B)

Sensation was lost to the level of the ankle and the development of deep hyperpigmentation with hemorrhagic bullae was noted in the presence of a cool foot. (Fig. 2)

The Podiatry service was consulted and recommended that the patient be taken to surgery for right foot and leg fasciotomy and to obtain deep cultures. Upon opening of the fascia, a watery discharge was noted in all compartments. No skin bleeding was noted at the incisions. (Fig. 3 A-C) After the fasciotomy was completed, the dorsalis pedis signal was found to be biphasic, however the posterior tibial signal was non-audible on Doppler. Intra-operative anaerobic, aerobic and fungal cultures were taken. The cultures grew Beta hemolytic streptococcus as well as Staphylococcus aureus.

Figure 2 Foot presentation before fasciotomy.

Despite the fasciotomies and broad spectrum antimicrobial therapy the patient was taken for further debridement later in the day. He went on to have an above the knee amputation. (Fig. 4)

The patient’s sepsis progressed to multiple organ failure, and the necrosis continued to spread. His final debridement was scheduled for a hip disarticulation, however radical debridement effectively halted the progress of the infection without further amputation. Despite his severe disease state, the patient’s condition stabilized.

Once the infection came under control and his vitals normalized, the patient was transferred to the community living center for continued nursing care and rehabilitation from 4/28/09 to 12/3/09. He was finally discharged to home with continued home nursing care. He was later fitted for a prosthetic device, and received training on gait and ambulation by our physical therapists.

On follow up review one year from initial surgery, he has remained ambulatory without problems to the right leg stump. The patient has been seen regularly in our Podiatry clinic for ongoing preventive foot care and minor wound problems on the contralateral limb.
Discussion

NF is a disease that is influenced by several risk factors, and whose outcome is based on early recognition and surgical treatment. Our patient demonstrated several risk factors which helped to initiate the infection (diabetes mellitus and immunosuppressive therapy). Since he was in an immunocompromised state, the early clinical signs of the infection were masked.

The largest additive risk factor to acquiring NF is diabetes mellitus. Our patient had a history of uncontrolled type 2 diabetes mellitus with an HgA1C ranging from 8.6-9.1%. Poorly controlled glucose levels can lead to additional associated risk factors such as arteriosclerosis, hypertension and neuropathy. They also can cause an immunocompromised state conducive to NF.

The patient was 15 years post liver transplant for hepatitis C. Due to his transplant, he was on chronic immunosuppressive therapy. His suppressed immune system contributed to the mild symptoms at the onset of the infection. This led to a delay in recognition and delayed surgical debridement. The ineffective immune response allowed the infection to progress at an accelerated pace. Furthermore, our patient was at a much greater risk for loss of life due to the multiple organ failure and sepsis. His creatinine was also elevated, placing him in a higher risk category for increased mortality and limb loss.

Several studies have shown that peripheral arterial disease (PAD) may contribute to the onset and progression of NF by limiting blood flow for healing and limiting the local tissue perfusion of antibiotics. The patient had no previous segmental leg pressure studies to confirm the presence of PVD before amputation. On admission, he had a palpable dorsalis pedis pulse with biphasic waveforms, but the posterior tibial pulse could not be heard on Doppler.

Figure 3 Anterior compartment fasciotomy. (A) Medial foot and posterior compartment fasciotomy. (B) Lateral compartment fasciotomy. (C)
Post-amputation dissection of the leg revealed calcification of the posterior tibial artery and a large plaque blockage at the level of the tarsal tunnel.

**Conclusion**

NF is a disease with a high probability of mortality, which is compounded by several additional risk factors. Early detection and surgical debridement, as well as aggressive antimicrobial therapy are essential to limit loss of limb or life. Several complicating factors contributed to the loss of limb in this case. Early detection and diagnosis was hindered by diabetes and immunosuppressive therapy. Nonetheless, the patient survived this life threatening episode due to aggressive surgical and medical management.

**References**