

Necrotizing fasciitis—A catastrophic complication following routine tibia fracture surgery

A case report and literature review

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Abstract

Rationale: Necrotizing fasciitis (NF) is defined as a rare, life-threatening, rapidly spreading soft tissue infection resulting from a polymicrobial origin, with a predominance of anaerobic organisms that presents with necrosis of the muscle, fascia, and surrounding soft tissue.

Patient concerns and diagnoses: A 64-year-old male who sustained tibia fracture caused by falling from a height underwent a tibia surgery with minimally invasive plate osteosynthesis technique in another institution. Postoperatively, the patient had development of a very uncommon NF at the site of the tibia procedure. When the patient was transferred to our unit, he rapidly progressed to toxic shock and coagulopathy.

Interventions and outcomes: Although the patient underwent antibiotics treatment in the emergency room and was transferred to the operating room for surgery promptly, the patient's condition deteriorated rapidly and he died of septic shock and multiple organ failure unfortunately.

Lessons: Our study aims to highlight the risk of NF in the elderly with diabetes during the perioperative period even if the injury is a simple closed fracture. Physicians must be vigilant to early inflammatory signs and pain in immunosuppressed patients.

Abbreviations: CT = computed tomography, LRINEC = laboratory risk indicator for necrotizing fasciitis, MIPO = minimally invasive plate osteosynthesis, MRI = magnetic resonance imaging, NF = necrotizing fasciitis, ORIF = open reduction and internal fixation.

Keywords: case report, complication, MIPO surgery, necrotizing fasciitis, tibia fracture

1. Introduction

Necrotizing fasciitis (NF) is a rare infectious process characterized by rapid, widespread necrosis of the skin, subcutaneous tissue, and superficial fascia, which can lead to fatal and/or limb-threatening systemic toxicity.^[1–3] Although the cognition of necrotizing fasciitis continues to improve, the mortality of this disease remains alarmingly high with reported mortality rates ranging from 6% to 76%.^[1,2,4] Recognized risk factors include increasing age and disease or treatment causing immunosuppression. Diabetes mellitus, the most common comorbidity, is present in 18% to 70.8% of cases.^[1,10]

Hereon, we report a case of NF occurring in the lower limb of a 64-year-old man following an uneventful closed fracture with

open reduction and internal fixation (ORIF) procedure. The development of NF following routine minimally invasive plate osteosynthesis (MIPO) surgery of tibia fracture has not, to our knowledge, been previously reported. The case report is expected to remind the orthopedists not to neglect another possibility of NF when encountering inflammation in the clinical practice. The family of patient was informed that data concerning the case would be submitted for publication, and they provided consent. This case report was approved by ethics committee of our hospital (Institutional Review Board of Hebei Medical University Third Hospital).

2. Case presentation

We described the clinical course of a 64-year-old Chinese man who was admitted to the hospital with septicemia and necrotic soft tissue inflammation of the right lower limb.

Fourteen days prior, a 64-year-old man, whose only known comorbidity was diabetes mellitus history, sought medical attention at another institution. He presented with pain, swollen, deformity of the right leg caused by falling from a height without any open trauma or neurovascular problem. The comminuted tibia fracture was confirmed with radiographs of the affected leg. Approximately 8 days after the injury, he underwent an uncomplicated routine MIPO surgery of the tibia fracture (Fig. 1), when the blood glucose levels near normal and the swelling subsided. And the patient as usual received a single dose of cefazolin preoperatively for a prophylactic antibiotic coverage.

On the second postoperative day, the patient had fever as well as pain and redness around the distal operative incision of the leg, despite postoperative antibiotics (cefazolin) were used for

Editor: Anna S. Levin.

The authors have no conflicts of interest to disclose.

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Medicine (2017) 96:23(e6908)

Received: 3 November 2016 / Received in final form: 12 April 2017 / Accepted: 20 April 2017

<http://dx.doi.org/10.1097/MD.0000000000006908>

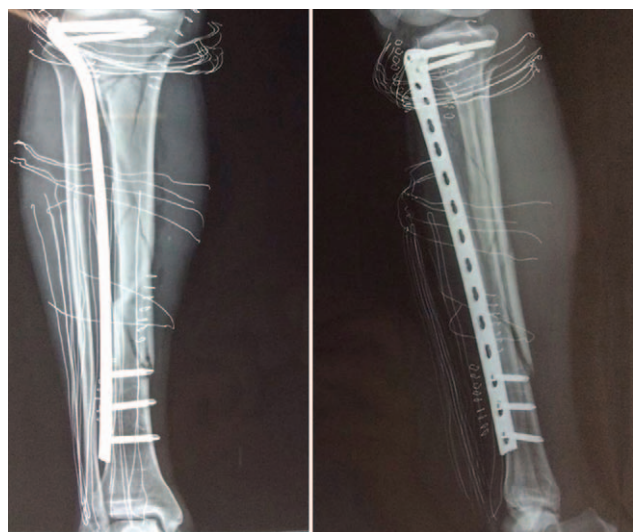


Figure 1. Postoperative radiograph of tibia fracture MIPPO surgery showing good reduction and minimal incision (arrow). MIPPO = minimally invasive plate osteosynthesis.

prevention. More seriously, the incision started discharge of foul-smelling white exudate the following day. Cellulitis was initially suspected, the sutured wound was opened immediately, and intravenous antibiotic (cefmenoxime) therapy was given empirically. However, the erythema, edema, and then serous-filled bulla progressed to the right proximal leg and distal foot over a 12-hour period. The patient was promptly taken to the operating room for emergency exploratory operation the same day; soft tissue necrosis and pus accumulation beneath the fascia were discovered when the leg was opened. And the patient underwent debridement of the right leg and foot without involving the thigh. On the second day of debridement surgery, the leg infection progressed, with the erythema extending to the distal portion of the right thigh.

The patient was then transported to our unit, which was the level-I trauma center in our region, 4 hours after the sudden onset of excruciating painful swelling in the right thigh and right inguinal area in association with generalized malaise and profound weakness in another institution. On admission to our emergency department, the patient had a temperature of 37.8°C, a blood pressure of 90/45 mm Hg, a pulse rate of 134 beats per minute, and a respiratory rate of 32 breaths per minute. Physical examination of the lower limb showed the erythema and swelling progressed to involve the right inguinal area and the scrotum. The right leg, which was cold, cyanotic, and with a pulse absent in the dorsal artery of the foot, was detected with crepitus and sensory and motor deficits. There was a large area cutaneous deficiency on the right foot, which was caused by first debridement, and desquamation from the derma was noticed on the medial aspect of the right ankle (Fig. 2). Laboratory abnormal findings included a hemoglobin level of 69.10 g/L, and a white blood cell count of $2.99 \times 10^9/L$ with 81.71% neutrophils; a platelet count of $34 \times 10^9/L$; a serum potassium level of 5.33 mmol/L; serum creatinine 94.50 $\mu\text{mol/L}$; a serum urea nitrogen level of 10.73 mmol/L; and a serum glucose level of 19.38 mmol/L. In addition, evolving disseminated intravascular coagulation (prothrombin time 20.70 s, international normalized ratio 1.86, D-dimer level 1.02 mg/L, etc.) and a serum sodium level of 126 mmol/L indicated a NF. As we did not detect the



Figure 2. Initially presentation of the lower limb when the patient just entered our institution, with the leg cyanotic and sloughing (A, B). Pay attention to the erythema of the thigh and inguinal region (C).

result of C-reactive protein in the emergency room, the laboratory risk indicator for necrotizing fasciitis (LRINEC) score may be 5 or greater. No radiographs, computed tomography, or magnetic resonance imaging were obtained upon presentation because of the hemodynamic instability.

A tentative diagnosis of NF with septic shock was made, and vancomycin and meropenem were given intravenously on an empirical basis. Urgent consultation of doctors including multidisciplinary reached a consensus that emergency amputation must be considered for saving life. Immediately, the patient was transferred to the operating room. Nevertheless, the patient's condition deteriorated rapidly and he died of septic shock and multiple organ failure before surgery can take place. And further investigation of the thigh in the operating room showed prominent skin blistering and bloody bulla with partial necrosis 3 hours after admission (Fig. 3). Histological examination of the surgical specimens confirmed the diagnosis of NF by showing necrosis of superficial fascia and subcutaneous fat, with dense infiltration of leucocytes and thrombosis of cutaneous vessels (Fig. 4). Additionally, cultures of surgical specimens verified the pathogen to be *Staphylococcus aureus*, which was sensitive to methicillin.

3. Discussion

The development of NF of the lower limb in this patient following closed fracture with ORIF surgery is of particular importance due to the fact that this disease rarely occurs during the perioperative period of a routine tibia MIPPO procedure. Medhi et al^[8] reported 2 cases of NF following common obstetric operative procedures in 2015. Previously, a case of NF occurring in the shoulder of a woman following an uneventful open rotator cuff repair and acromioplasty was reported by Zani and Babigian.^[6] Numerous studies^[1,9,10] have demonstrated that causes of NF is commonly associated with initial open trauma, chronic skin ulcer, abscess, injection, multiple needle punctures etc.; however, there has been



Figure 3. Note the swollen and nigrescent scrotum (A, red arrow) and formation of skin blistering and bloody bulla on the thigh (B, arrow) in our operation room.

few literatures referring to the NF as a complication following a clean surgery particularly in the area of orthopedics.

Early diagnosis and extensive surgical debridement of affected tissue performed within 24 hours are associated with a lower mortality.^[1,4] However, the early diagnosis of NF presents unique challenges to the orthopedic surgeon owing to the paucity of typical cutaneous findings early in the course of the disease and the use of broad-spectrum antibiotics, which may mask the severity of the underlying infection originally.^[10,12] It is acknowledged that the prevalence of NF is such that the average practitioner will see only 1 or 2 cases in his or her career. Severe pain out of proportion to the physical findings, the most sensitive symptom, is noted in nearly 100% of patients with NF.^[1,10] However, we hypothesized that the extensive use of nonsteroidal anti-inflammatory drug (NSAID) for pain relief after operation may be another factor to hinder the early diagnosis of NF. Thus, the physician in our case was initially not conscious of the possibility about NF, and delayed diagnosis was inevitable. Mortality is directly proportional to time to intervention, and a delay in first surgical debridement has a significant adverse effect on survival.^[10]

Moreover, the first debridement was closefisted and not radical, which was merely limited to the leg and foot, as the underlying infection had progressed to the thigh in all probability at that time. The more aggressive and extensive treatment (even amputation if willing to) in the first debridement surgery at another institution recommended to the patient may have been lifesaving. The advanced age and hyperglycemia may also contribute to this disease, and it indicates us that perioperative glycemic control is of vital importance.

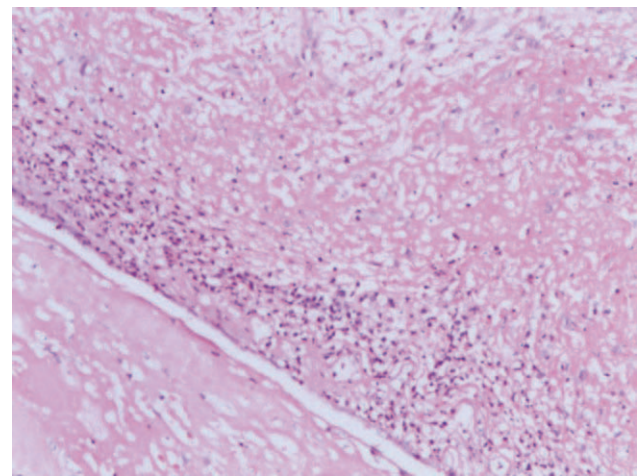


Figure 4. Histological examination of the surgical specimens.

A retrospective single-center review showed that 35% of cases were initially misdiagnosed as simple cellulitis, superficial erysipelas, or abscesses presenting with only pain, tenderness, and warm skin.^[2,10] The findings of a high white blood cell count and a serum sodium concentration of <135 mmol/L have been suggested as a way to distinguish NF from normal soft tissue infection.^[6,7] The LRINEC score described by Wong et al^[5] may be helpful to detect NF, which is based on the white blood cell count and the levels of C-reactive protein, hemoglobin, serum sodium, serum creatinine, and serum glucose upon admission.^[1,4] Wang and Hung investigated the use of tissue oxygen monitoring with near-infrared spectroscopy for the diagnosis of NF, which was an interesting and innovative diagnosis method.^[10,11] To clarify the diagnosis, Andreassen et al^[3] suggested that the surgeon could perform a “finger test,” in which a 2-cm incision is made to probe the level of the superficial fascia under local anesthesia. Although a variety of diagnostic methods are introduced, surgical exploration remains the golden standard for diagnosis.^[10,12]

In summary, NF can be associated with a closed tibia fracture MIPO surgery, and orthopedic surgeons should be aware or cautious of this potential complication during the perioperative period especially in elderly, immunosuppressive people.

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