Necrotizing fascitis: an epidemiologic study of 102 cases

Mohammad Sadegh Fazeli · Mohammad Reza Keramati

Received: 5 July 2006 / Accepted: 19 September 2007

Abstract

Background Necrotizing fascitis is a progressive, rapidly spreading, inflammatory infection located in deep fascia. It may cause necrosis of skin and subcutaneous tissues. Spreading of it may lead to shock, organ failure and even death.

Methods In this study, we evaluated prevalence of variables including predisposing factors, clinical and paraclinical findings, distribution of tissue involvement and mortality rate in 102 patients of necrotizing fascitis at our Hospital between the years 1995 and 2005.

Results Prevalence of this disease was higher in males than females with the rate of 2.6:1. Diabetes mellitus was the most common predisposing disease. Genital region was the most common site of involvement. Muscles were involved in 25.5% of cases. Nonspecific erythema was the main dermatological manifestation. The most common organism was *Enterococcus faecalis* and mortality rate was 10.8%.

Conclusion Necrotizing fascitis is an infectious disease with high mortality rate and frequently with non-specific skin and general manifestations. High suspicion while visit-

ing primary signs and surgical debridement can be effective in decreasing the rate of morbidity and mortality.

Keywords Necrotizing fascitis · Necrosis · Gangrene · Fascia · Infection

Introduction

Necrotizing fascitis is a progressive, rapidly spreading, inflammatory infection located in deep fascia. It may cause necrosis of skin and subcutaneous tissue and can even results in involvement of adjacent soft tissues such as muscles (necrotizing myositis) (Fig. 1). In addition to direct spreading of the necrosis to adjacent tissues, distribution of the disease via blood vessels and lymphatic can lead to shock, organ failure and death [1, 2].

Prevalence of this disease in adults is higher than children (0.4 and 0.08 cases for each 100,000 population in adults and children respectively) [3]. The incidence of this disease has increased about five folds during the last decade, which can be partly due to increase in the number of immune deficient patients and even may be due to frequent reports during the recent years.

There are several predisposing factors that may lead to an increase in the susceptibility for persons to this disease. Immune deficiency is the main factor that can be due to diabetes mellitus, complement C4 deficiency, AIDS, malignancies and drugs [4].

Each factor that influences the health and integrity of the skin or mucus membranes can result in penetration of infection. Primary infection can penetrate due to skin trauma, infected needle in intravenous drug abusers or previous dermatological diseases such as psoriasis and bed sore. Mucosal membranes in gastrointestinal or genitourinary systems are the other routes of infection [2]. In addition,

M. Fazeli · M. R. Keramati
Department of Surgery, Imam Hospital,
No. 60, Gharib St., Keshavarz Blvd., Tehran,
PO Box: 13145-158,
Iran
E-mail: dr_morezak@yahoo.com

hematogenous translocation plays an important role in microbial infection of this disease. Infection is often polymicrobial, which can be anaerobic or a mixture of aerobic and anaerobic [5].

Necrotizing fascitis can involve every part of body, but limbs are the most common site of involvement in adults [6] and thorax and abdomen in children.

Main primary dermatological manifestation is pain in the site of primary infection. Edema and erythema will develop afterwards. In physical examination, the skin is red, warm and swelling can be detectable which is very similar to cellulites [2]. Necrosis will happen after several days or weeks – as a result of vascular thrombosis – and then the red discoloration of skin will change to violet or black [7, 8]. Anatomically, a layer of necrotic tissue that is not limited with inflammatory reaction is characteristic for this infection, so the involved skin does not have clear margins [9]. Necrosis results in easy transmission of infection from skin to subcutaneous fat and fascia layers [2]. Systemic symptoms such as chills and fever, tachycardia, tachypnea, fatigue and weakness are other signs and symptoms. As a result of rapidly spreading and even fatal nature of this disease, immediate diagnosis is very important.

Primary diagnosis is based on being suspicious while visiting primary dermatological manifestations. In the next step, paraclinical findings can help us in diagnosis. Histological tests such as biopsy, blood and tissue cultures, Gram staining and radiological measures such as plain radiograph, sonography, CT or MRI (if available) are other valuable tools in diagnosis. For example, presence of gas in tissues is an important radiological finding.

The most effective treatment for this disease is rapid primary diagnosis and surgical debridement. Gold standard treatment includes intravenous therapy such as antibiotics, surgical debridement and intensive care. Surgical fasciotomy can be performed, if needed [1].

Mortality rate of up to 73% has been reported in previous studies [10]. This rate is directly related to the age of patients [11]. According to some studies, mortality rate is higher in cases with involvement of head and neck, thorax or abdomen [12].

As a result of high mortality rate in patients suffering from this disease and lack of enough statistical researches in this field, we decided to evaluate the prevalence of clinical and paraclinical findings in addition to predisposing factors in these patients.

Methods

This is a study, which was conducted at Tehran Medical University. The medical records of all patients who had been admitted to a referral department for necrotizing fas-

citis (located at Tehran's Imam Hospital affiliated to Tehran University of medical sciences) from 1995 to 2005 were reviewed. This study was approved by ethics committee of the university.

This study searched the database of our referral department for all the patients with diagnosis of necrotizing fascitis. The diagnosis in all patients had been confirmed by attending professors. 102 cases (74 male and 28 female) were found and we evaluated all of them. We did not exclude any case. Variables such as patients' personal information, predisposing factors, clinical findings, paraclinical findings (laboratory and radiological) and distribution of tissue involvement were extracted from the files.

We evaluated the presence of diabetes mellitus, intravenous drug abusing, malignancy and past history of surgery or trauma as the main predisposing factors. Clinical findings were included both general (included fever, loss of consciousness, change in pulse rate and gastrointestinal symptoms such as nausea and vomiting) and dermatological manifestations (included erythema, ulcer, gangrene, crepitation, pain, discharge and swelling). All X-Rays of the patients reassessed for the presence of any gas in the involved areas. Blood and skin cultures were our laboratory variables. The skin specimens were exudates from deep skin tissues. Antibiotics sensitivity (antibiograms) of all microorganisms gathered. In addition we assessed the mortality rate and the reported etiology in each case.

Extracted data were analyzed using SPSS-10.0.1 software for calculating the prevalence of each factor.

Results

In this study, 102 cases of necrotizing fascitis evaluated including 74 males (72.5%) and 28 females (27.4%). Average age of patients was 45.4 (range: 11 to 82 years old). Age of 8 cases (7.8%) was lower than 20 years old and 28 cases (27.4%) higher than 60 years old. Average delay from beginning of the disease until referring to the hospital was 15.5 days (range: 2 to 35 days).

In evaluation of predisposing factors, diabetes mellitus was found in 44 cases (43.1%), intravenous drug abusing in 24 cases (23.5%), history of trauma in 24 cases (23.5%), previous history of surgery in the involved area in 4 cases (3.9%) and malignancy in 2 cases (1.9%). History of surgery consisted of aspiration of inguinal abscess, aspiration of scrotal abscess, vasectomy and surgery of ovarian cyst. Non-Hodgkin lymphoma and larynx cancer were the malignancy cases.

Genital and perianal involvement was seen in 38 cases (37.3%) and 32 cases (31.4%) respectively. In all, 50 cases (49%) had involvement of perineal region (including genital and/or perianal parts). Involvement of upper and lower limb was found in 34 patients (33.3%) and 10 patients (9.8%) respectively. Skin of lower part of abdomen

Fig. 1 Necrotizing fascitis located in deep fascia

was involved in 34 patients (33.3%) and none of the cases had upper abdomen skin problem.

Skin manifestations included: erythema 62.7% (64 cases), pain 56.9% (58 cases), ulcer 47.1% (48 cases), crepitation 41.2% (42 cases), swelling 39.2% (40 cases), skin discharge 27.5% (28 cases) and gangrene 41.2% (28 cases). Loss of consciousness was detected in 10 patients (9.8%), fever of higher than 38 degree in 46 cases (45%), tachycardia (pulse rate of greater than 110 per minute) in 28 cases (27.4%) and nausea in 12 cases (11.7%).

Skin culture of 15 cases (6.8%) was positive including 5 cases with *Enterococcus Fecalis* (sensitive to Amikacin, Ceftizoxime, Cefotaxime and Ciprofloxacin), 3 cases with *Acinetobacter* (sensitive to Amikacin, Cefotaxime, Ampicillin-Sulbactam), 3 cases with *Staphylococcus Aureus* (sensitive to Vancomycin, Ciprofloxacin, Nafcillin, Oxacillin), 2 cases with *Streptococcus Pyogenes* (sensitive to Clindamycin, Erythromycin, Ciprofloxacin, Ceftazidime), one case with *Proteus* (sensitive to Ciprofloxacin, Gentamicin, Ceftazidime, Ampicillin-Sulbactam, Amikacin) and one case with *Pseudomona Aeruginosa* (sensitive to Ciprofloxacin, Gentamicin, Ceftazidime, Amikacin, Ceftriaxone). Blood culture was positive in only one of the patients that was reported *Staphylococcus Aureus* (sensitive to Vancomycin, Ciprofloxacin, Nafcillin, Oxacillin).

In laboratory tests of patients, 70 cases (68.6%) had leucocytosis ($WBC > 11000 \times 10^6/L$) and all of them had neutro-

philia ($PMN > 70\%$). High fasting blood sugar was found in 44 cases (43.1%). All of the patients had high erythrocyte sedimentation rate ($ESR > 20mm/h$). 18 cases (17.6%) had an increase in the level of creatinine ($Cr > 1.5 g/d$) and urine culture of 2 patients (1.9%) was reported positive (*Acinetobacter* and *Ecloi*). Gas was reported in plain radiograph of 30 cases (29.4%).

Muscle was involved in 26 cases (25.5%). Extensive surgical debridement was done for 90 patients (88.2%). 13 cases (10.8%) died. Myocardial infarction (9 cases), septic shock (2 cases), congestive heart failure (1 case), and chronic renal failure (1 case) were the reported etiologies of deaths.

Discussion and Conclusion

In this study, the number of male patients with the diagnosis of necrotizing fascitis was higher than the number of female patients with the male/female ratio of 2.6:1. This can be explained by relatively higher prevalence of perineal and genital involvement in males and the fact that more than half of the patients in this study suffered from involvement of these areas.

Average age of patients in this study (45.4) was lower than previous studies (53.8) [13]. Relatively great number of cases under 20 years of age (in relation to previous

studies) and lack of hygiene after trauma in this group (6 out of 8 patients) were the main reasons.

Most common predisposing disease was diabetes mellitus in about half of the cases. That is because; diabetes affects immune system [4] and results in susceptibility to infections. Intravenous drug abusing and history of trauma were the next most prevalent causes.

About half of the cases had perineal involvement (including genital and/or perianal regions). Limbs were involved in another half of the cases. Number of patients with lower limb involvement was higher than cases of lower limb disease. In a previous study, involvement of limbs had reported 81% [14] that was higher than our result.

As a result of infectious and inflammatory nature of this disease, number of neutrophils in peripheral blood and inflammatory factors (such as ESR) will increase. These factors were higher than normal in all of the cases in our study.

In this study, involvement of muscles was lower than previous studies [14]. The reported percentages muscle involvement in previous studies were 46%.

Mortality rate of this disease has reported up to 73% in previous studies [10] that was so much higher than our result (10.8%).

In conclusion, necrotizing fascitis is an infectious disease with relatively high mortality rate (10.8% in our study) and nonspecific skin and general manifestations (including erythema, pain and ulcer). High suspicion while visiting primary signs and surgical debridement can be effective in decreasing the rate of mortality and morbidity of this disease.

References

1. Hansen SL, Mathes SJ, Young DM (2005) Skin and subcutaneous tissue. In: F. Charles Brunnicardi, et al; Schwartz principles of surgery; 8th edition; Mc Graw Hill, pp 429–452
2. Stevens DL (2005) Infections of the skin, muscle and soft tissues. In: Braunwald E, Kasper DL, Hauser SL, et al; Harrison's principles of internal medicine; 16th edition; Mc Graw Hill, pp 740–749
3. File TM, Tan JS, Dipersio JR (1998) Diagnosing and treating the "Flesh Eating Bacteria Syndrome." *Clev Clin J Med* 65(5):241–249
4. Tang S, Kwok TK, Ho PL, et al (2002) Necrotizing fasciitis in a renal transplant recipient treated with FK506: the first reported case. *Clin Nephrol* 56:481–485
5. Marvin L, Corman, et al (1998) Infectious Conditions. In: Colon & Rectal Surgery; 4th edition; Lippincot Raven pp 513–515
6. Childers BJ, Potyondy LD, Nachreiner R, et al (2002) Necrotizing fasciitis: A fourteen-year retrospective study of 163 consecutive patients. *Am Surg* 68:109–116
7. Childers BJ, Potyondy LD, Nachreiner R, et al (2002) Necrotizing fasciitis: A fourteen-year retrospective study of 163 consecutive patients. *Am Surg* 68:109–116
8. Jarrett P, Rademaker M, Duffill M (1997) The clinical spectrum of necrotizing fasciitis. A review of 15 cases. *Aust N Z J Med* 27(1):29–34
9. David C Sabiston, et al; (1997) Surgical Infections and choices of antibiotics. In: Sabiston textbook of surgery; 15th edition; W.B.Saunders company pp 269–271
10. Kotrappa KS, Bansal RS, Amin NM (1996) Necrotizing fasciitis. *Am Fam Phys* 53(5):1691–1696
11. Hoeffel JC, Hoeffel F (2002) Necrotizing fasciitis and purpura fulminans. *Plast Recon Surg* 109:2165
12. Kilic A, Aksoy Y, Kilic A (2001) Fournier's gangrene: Etiology, treatment, and complications. *Ann Plast Surg* 47: 523–527
13. Sanchez Mazzaferri F, Fadil Iturralde JL, Provenzal O, Damiani H, Milman A, Bragagnolo J, Yunes J, Campodonico A (1999) Fournier's gangrene, Our experience over 10 years. *Arch Esp Urol* 52(7):721–727
14. Parenti GC, Marri C, Calandra G, Morisi C, Zabberoni W (2000) Necrotizing Fascitis of soft tissues; *Radiol Med* 99(5):334–339