International Journal of Innovative Research in Medical Science (IJIRMS)
Volume 03 Issue 07 July 2018, ISSN: 2455-8737, Imp. Factor - 4.102
Available online at - www.ijirms.in

Open Access Journal | Research Article | DOI: 10.23958/ijirms/vol03-i07/06

Necrotizing Fasciitis and Methicillin Resistant Staphylococcus Aureus

Dr. Rima W. Ninawe[1], Dr. Wasudeo Gyanidas Ninawe[*2]

[1]Associate professor Dept. of Microbiology CCM Medical College Kachandur, Durg
[2]Professor and HOD Dept. of Surgery, CCM Medical College Kachandur, Durg

*__*Corresponding author -*__

Dr. Wasudeo Gyanidas Ninawe
Professor and HOD Dept. of Surgery, CCM Medical College Kachandur, Durg

Abstract

Necrotizing fasciitis (NF) is an aggressive and life-threatening infection of skin and soft tissue characterized by widespread fascial necrosis which leads to morbidity and mortality if left untreated. There is difficulty in managing this condition because there is a combination of difficulty in diagnosis, and also of early as well as late management. It can be caused by either a single organism or more frequently by a variety of microbes - both aerobic and anaerobic. Necrotizing fasciitis seems to have preponderance in males, perhaps due to increased incidence of trauma in males. Staphylococcus aureus is the most prevalent pathogen in hospitals and communities and MRSA has become a common isolate associated with skin and soft tissue infections over the past few years, monomicrobial MRSA necrotizing fasciitis has been reported only in a few studies. Early surgical intervention, early diagnosis and aggressive treatment should be done. ***Material and Methods:*** All patients were diagnosed as NF on surgical report. Surgical exploration is undertaken after resuscitation. Penicillin along with, an amino glycoside and clindamycin or metronidazole is administered preoperatively in moribund patients. Cefoxitin or imipenem or meropenem is used in more limited infections. Fair amount of desloughing is done without anesthesia. Overlying fat as patchy greenish-black liquefaction necrotic tissues are excised primarily, and specimen sent for culture in microbiology department. Cultures were processed the susceptibility of S. aureus isolates to antimicrobials was done. ***Results*:** A total of 200 hospitalized patients those who were surgically treated for NF were included in the study. Of the 200 patients 42 patients were culture positive for MRSA. In our study mean age was 56± 11.21 of which 124 (62%) were male , mean hospitalization days were 16.5± 6.2. patients with underlying diabetes mellitus were 66 (33%) and hypertension were 74(37%). In MRSA group (n=42) mean age was 53 ± 9.22. Male were 36 (73.81%) , mean hospitalization days were 17.6 ± 6.2. patients with underlying diabetes mellitus were 21 (50%) and hypertension were 19(45.24%).42 (21%) were MRSA, 31 (15.5%) were MSSA, 21 (10.5%) were coagulase negative staphylococcus, 4(2%) were Streptococcus group A, 11 (5.5%) were Streptococcus species, 6 (3%) were Bacillus species, 24 (12 %) were Escherichia coli, 19 (9.5%) were Acinetobacter species, 3 (1.5%) were Candida albicans and in 30 (15%) no growth was observed in culture. ***Discussion and Conclusion:*** Some experts recommend use of broad-spectrum empirical antimicrobial therapy for suspected cases of necrotizing fasciitis and therapy directed against MRSA is not a standard practice. For treatment selection of appropriate antimicrobial agents for any suspected necrotizing fasciitis must take into account the nature of patient's exposure and local epidemiologic data but no reliable epidemiological or clinical risk factors with MRSA from those infected with MSSA or non-S. aureus are available. In our study mean age of patients diagnosed NF was 53 ± 9.22. While male were 36 (73.81%). In study by Cheng NC et al. the median age was 62 years (range, 12-81 years) There was male predominance in NF by MRSA in our study . In our study lesions on extremities had better prognosis similar results were shown in other study. Necrotizing fasciitis caused by MRSA is a challenge to the treating surgeon. Prompt diagnosis and surgical management with empiric MRSA cover in areas where community acquired MRSA (CA-MRSA) is endemic. Lesions of extremities have better prognosis where MRSA infection is becoming endemic and empirical treatment of suspected necrotizing fasciitis or pneumonia should include active MRSA cover.

Introduction

Necrotizing fasciitis (NF) is an aggressive and life-threatening infection of skin and soft tissue characterized by widespread fascial necrosis which leads to morbidity and mortality if left untreated.[1] Necrotizing fasciitis (NF) is one of the most challenging surgical infections faced by a surgeon. There is difficulty in managing this condition because there is a combination of difficulty in diagnosis, and also of early as well as late management. Necrotizing fasciitis can be defined as any necrotizing soft tissue infection spreading along fascial planes with or without overlying cellulitis.[2] It can be caused by either a single organism or more frequently by a variety of microbes - both aerobic and anaerobic. [3] Suppuration in the tissue beneath the skin (sopha), with danger of pus spreading to surrounding healthy tissues has been mentioned in Susrutha Samhita.[4] The first description of NF was reported by Joseph Jones, a surgeon in the Confederate Army of United States in 1871.[5] This condition was diagnosed in 2642 soldiers during the civil war and a mortality of 46%.[6]

Necrotizing fasciitis seems to have preponderance in males, perhaps due to increased incidence of trauma in males.[7] The most common surgical wound infection is a simple abscess, but any patient who develops redness and induration of an incision is at

risk for necrotizing fasciitis. It has been reported from laparoscopy, endoscopic gastrostomy, tube thoracostomy, and thoracotomy sites as well as after endoscopic sphincterotomy.[8,9,10] Pre-disposing factorsin NF are diabetes and advanced age.[11] and more prevalent in developing countries and is attributed to their low standards of hygiene and poor socioeconomic status.[12]

Giuliano proposed two bacteriologically distinct groups[13] Type 1 which comprise a majority of the patients, isolate anaerobic bacteria including bacterioides with facultative anaerobic bacteria, Enterobacteriaceae and non-group A streptococci. Type 2 - is less common and isolate Group A Streptococcus alone or in combination with bacteria other than anaerobes or Enterobacteriaceae. Staphylococcus aureus is the most prevalent pathogen in hospitals and communities and MRSA has become a common isolate associated with skin and soft tissue infections over the past few years, monomicrobial MRSA necrotizing fasciitis has been reported only in a few studies.[14,15] Several virulence factors are reportedly associated with the pathogenicity of skin and soft tissue infections by MRSA Panton-Valentine leukocidin (PVL), γ-hemolysin (Hlg) are associated with pus-forming diseases, PVL genes generally cause skin and soft tissue infections and necrotizing fasciitis.[14] Toxic shock syndrome toxin 1 (TSST-1) can cause in part a desquamative skin rash and toxemic syndrome.[16]

Early surgical intervention, early diagnosis and aggressive treatment should be done, as delay in diagnosis and treatment is associated with a greater morbidity and mortality.[17]

Material and Methods

A total of 200 hospitalized patients were surgically treated in the Dept. of Surgery in collaboration with Dept. of Microbiology at CCM Medical College and hospital.

All patients were diagnosed as NF on surgical report surgical exploration is undertaken after resuscitation. Penicillin along with, an amino glycoside and clindamycin or metronidazole is administered preoperatively in moribund patients. Cefoxitin or imipenem or meropenem is used in more limited infections. Fair amount of desloughing is done without anesthesia as the tissues are devoid of sensation. Incisions are made through the discolored skin down to the fascia, parallel to the cutaneous nerves and blood vessels. Overlying fat as patchy greenish-black liquefaction necrotic tissues are excised primarily, and specimen sent for culture in microbiology department immediately after the procedure and diagnosis was verified by pathological examination. Necrotizing fasciitis was defined by the following findings; the presence of greyish necrotic fascia; lack of resistance of muscular fascia that was freely dissected using a blunt instrument along the normal adherent tissue planes; the presence of foul-smelling "dish-water" pus; and/or, extensive necrosis of the skin and subcutaneous tissues.[18] Cultures were processed the susceptibility of S. aureus isolates to antimicrobials was done.

Results

A total of 200 hospitalized patients those who were surgically treated for NF were included in the study. Of the 200 patients 42 patients were culture positive for MRSA.

Table 1: Demographic data and Clinical characteristics of NF patients

	Total (n= 200)	MRSA (n=42)
Age (mean, yr.)	56± 11.21	53 ± 9.22
Male (n, %)	124 (62%)	36 (73.81%)
Mean hospitalization (mean, days)	16.5± 6.2	17.6 ± 6.2
Underlying Diabetes mellitus	66 (33%)	21 (50%)
Hypertension	74(37%)	19(45.24%)

Of the total 200 patients included in the study mean age was 56± 11.21 of which 124 (62%) were male , mean hospitalization days were 16.5± 6.2. patients with underlying diabetes mellitus were 66 (33%) and hypertension were 74(37%). In MRSA group (n=42) mean age was 53 ± 9.22. Male were 36 (73.81%), mean hospitalization days were 17.6 ± 6.2. patients with underlying diabetes mellitus were 21 (50%) and hypertension were 19(45.24%).

Table 2: Microbial species associated with NF

Organism	n = 200	%
Staphylococcus aureus (MRSA)	42	21
Staphylococcus aureus (MSSA)	31	15.5
Coagulase negative Staphylococcus	21	10.5
Streptococcus group A	4	2
Streptococcus species	11	5.5
Bacillus species	6	3
Escherichia coli	24	12
Enterobacter species	19	9.5
Acinetobacter species	9	4.5
Candida albicans	3	1.5
No growth	30	15

Of the total 200 cases 42 (21%) were MRSA, 31 (15.5%) were MSSA, 21 (10.5%) were coagulase negative staphylococcus, 4(2%) were Streptococcus group A, 11 (5.5%) were Streptococcus species, 6 (3%) were Bacillus species, 24 (12 %) were Escherichia coli, 19 (9.5%) were Acinetobacter species, 3 (1.5%) were Candida albicans and in 30 (15%) no growth was observed in culture.

Discussion and Conclusion

Necrotizing fasciitis is usually caused by a mixture of aerobic and anaerobic organisms and monomicrobial MRSA necrotizing fasciitis reports are shown in the litreture.[14] Some experts recommend use of broad-spectrum empirical antimicrobial therapy for suspected cases of necrotizing fasciitis and therapy directed against MRSA is not a standard practice.[14] Empiric treatment recommendation for necrotizing fasciitis includes agents effective against both aerobes, including MRSA, and anaerobes.[19] Debridement into the tissues below the deep fascia isgenerally not indicated, except when external injury has penetrated the layer and amputation is rarely indicated because of the superficial involvement.[20] Majeski in his article states the need to preserve all viable tissues including nerves, muscles, subcutaneous tissue, skin, and blood vessels.[17] Patients with extensive skin loss require meshed split thickness skin grafts. Primary closure with simple suturing can be done when raw area is small or when skin around can be mobilized, as in scrotum.[21] For treatment selection of appropriate antimicrobial agents for any suspected necrotizing fasciitis must take into account the nature of patient's exposure and

local epidemiologic data but no reliable epidemiological or clinical risk factors with MRSA from those infected with MSSA or non-S. aureus are available.[22]

In our study of the total 200 cases 42 (21%) were MRSA which was similar to the study by Changchien C-H in which the prevalence of MRSA in 247 NF cases over a four-year period was 19.8%.[3] While some reports of MRSA infections, have established that MRSA is responsible for 3.6% to 39% of NF disease.[14,23] In our study mean age of patients diagnosed NF was 53 ± 9.22. While male were 36 (73.81%). In a study by Cheng NC et al.[24] the median age was 62 years (range, 12-81 years) There was male predominance in NF by MRSA in our study

Young non-diabetic patients with extremity infections have the best prognosis.[13] In our study 21 (50%) were diabetic and had longer stay but no mortality. While patients with hypertension were 19(45.24%). In our study lesions on extremities had better prognosis similar results were shown in other study.[25]

To conclude necrotizing fasciitis caused by MRSA is a challenge to the treating surgeon. Prompt diagnosis and surgical management with empiric MRSA cover in areas where community acquired MRSA (CA-MRSA) is endemic for suspected cases of MRSA necrotizing fasciitis can prevent the mortality and morbidity. Lesions of extremities have better prognosis where MRSA infection is becoming endemic and empirical treatment of suspected necrotizing fasciitis or pneumonia should include active MRSA cover.

References

[1] Chauhan H, Patil S, Hajare A, Krishnaprasad K, Bhargava A. Necrotizing Fasciitis of Hand By Methicillin Resistant Staphylococcus aureus (MRSA) – A Sinister. Journal of Clinical and Diagnostic Research : JCDR. 2015;9(6):

[2] Ahrenholz DH. Necrotizing soft-tissue infections. Surg Clin North Am. 1988 Feb; 68(1):199-214.

[3] Changchien CH, Chen YY, Chen SW, Chen WL, Tsay JG, Chu C. Retrospective study of necrotizing fasciitis and characterization of its associated methicillin-resistant Staphylococcus aureus in Taiwan. BMC Infect Dis. 2011 Oct 31; 11():297.

[4] Ray P, Gupta HN, Roy M. New Delhi: Indian National Science Academy; 1980. In Susrutha Samhita (A scientific synopsis) p. 99

[5] WILSON B. Necrotizing fasciitis. Am Surg. 1952 Apr; 18(4):416-31.

[6] Janevicius RV, Hann SE, Batt MD. Necrotizing fasciitis. Surg Gynecol Obstet. 1982 Jan; 154(1):97-102

[7] Lancerotto L, Tocco I, Salmaso R, Vindigni V, Bassetto F. Necrotizing fasciitis: classification, diagnosis, and management. J Trauma Acute Care Surg. 2012 Mar; 72(3):560-6.

[8] Sotrel G, Hirsch E, Edelin KC. Necrotizing fasciitis following diagnostic laparoscopy. Obstet Gynecol. 1983 Sep; 62(3 Suppl):67s-69s.

[9] Pingleton SK, Jeter J. Necrotizing fasciitis as a complication of tube thoracostomy. Chest. 1983 Jun; 83(6):925-6.

[10] Necrotizing fasciitis--a complication of "successful" endoscopic sphincterotomy. Gastrointest Endosc. 1990 Jul-Aug; 36(4):425-6.

[11] Howard RJ, Pessa ME, Brennaman BH, Ramphal R. Necrotizing soft-tissue infections caused by marine vibrios. Surgery. 1985 Jul; 98(1):126-30.

[12] Majeski JA, Alexander JW. Early diagnosis, nutritional support, and immediate extensive debridement improve survival in necrotizing fasciitis. Am J Surg. 1983 Jun; 145(6):784-7.

[13] Giuliano A, Lewis F Jr, Hadley K, Blaisdell FW. Bacteriology of necrotizing fasciitis. Am J Surg. 1977 Jul; 134(1):52-7.

[14] Miller LG, Perdreau-Remington F, Rieg G, Mehdi S, Perlroth J, Bayer AS, Tang AW, Phung TO, Spellberg B. Necrotizing fasciitis caused by community-associated methicillin-resistant Staphylococcus aureus in Los Angeles. N Engl J Med. 2005 Apr 7; 352(14):1445-53.

[15] Young LM, Price CS.Community-acquired methicillin-resistant Staphylococcus aureus emerging as an important cause of necrotizing fasciitis. Surg Infect (Larchmt). 2008 Aug; 9(4):469-74.

[16] Warner JE, Onderdonk AB. Diversity of toxic shock syndrome toxin 1-positive Staphylococcus aureus isolates. Appl Environ Microbiol. 2004 Nov; 70(11):6931-5.

[17] Majeski JA, Alexander JW. Early diagnosis, nutritional support, and immediate extensive debridement improve survival in necrotizing fasciitis. Am J Surg. 1983 Jun; 145(6):784-7.

[18] Wong CH, Chang HC, Pasupathy S, Khin LW, Tan JL, Low CO. Necrotizing fasciitis: clinical presentation, microbiology, and determinants of mortality. J Bone Joint Surg Am. 2003 Aug; 85-A (8):1454-60.

[19] Stevens DL, Bisno AL, Chambers HF, Dellinger EP, Goldstein EJ, Gorbach SL, Hirschmann JV, Kaplan SL, Montoya JG, Wade JC, Infectious Diseases Society of America. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the Infectious Diseases Society of America. Clin Infect Dis. 2014 Jul 15; 59(2):e10-52.

[20] Miller JD. The importance of early diagnosis and surgical treatment of necrotizing fasciitis. Surg Gynecol Obstet. 1983 Sep; 157(3):197-200.

[21] Ciftci H, Verit A, Oncel H, Altunkol A, Savas M, Yeni E, Bitiren M, Guldur ME. Amputation of the penis and bilateral orchiectomy due to extensive debridement for Fournier's gangrene: case report and review of the literature. J Pak Med Assoc. 2012 Mar; 62(3):280-2.

[22] Miller LG, Perdreau-Remington F, Bayer AS, Diep B, Tan N, Bharadwa K, Tsui J, Perlroth J, Shay A, Tagudar G, Ibebuogu U, Spellberg B. Clinical and epidemiologic characteristics cannot distinguish community-associated methicillin-resistant Staphylococcus aureus infection from methicillin-susceptible S. aureus infection: a prospective investigation. Clin Infect Dis. 2007;44:471–482.

[23] David E, Joseph AK, Roy AMM. The microbiology of necrotizing soft tissue infections. Amer J Surg. 2000; 179:361–366.

[24] Cheng NC, Wang JT, Chang SC, Tai HC, Tang YB. Necrotizing fasciitis caused by Staphylococcus aureus:

the emergence of methicillin-resistant strains. Ann Plast Surg. 2011 Dec; 67(6):632-6.

[25] Buchanan CS. Necrotizing fasciitis due to group A beta-hemolytic streptococci. Arch Dermatol. 1970 Jun; 101(6):664-8.

