



## A PROSPECTIVE CLINICAL AND MICROBIOLOGICAL STUDY OF NECROTIZING FASCIITIS

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### ABSTRACT

Necrotizing fasciitis (NF) is a rare but potentially fatal infection involving the subcutaneous tissue and fascia. It is commonly known as *flesh-eating disease*.

**Aim of the study:** This study is a prospective study on Necrotizing fasciitis its Clinical incidence, etio-pathogenesis in a rural hospital of India

**Place of study:** Department of General surgery Chennai Medical College Hospital & Research centre, Irungalur, Trichy, Tamilnadu, India

The study period was from Feb 2010 – Feb 2013 and was prospective in design. A total of 27 patients were diagnosed to have Necrotizing fasciitis and entered our study group.

### Results

- In total 27 patients the study reported the age group ,gender, common anatomical site and modalities of treatment Patients who were above 18 years of age were included in study,
- The offending organism was identified by a culture swab sent on the first day. This was repeated on the 7<sup>th</sup> day and earlier if there was no adequate response to medication. The sensitivity of the organisms to the various antibiotics was also studied.
- Patients with Fournier's gangrene were also included in the study

**KEYWORDS :** fasciitis, Necrotizing fasciitis, soft tissue infections, tissue gangrene

### AIM OF STUDY

- To study the incidence of the necrotizing fasciitis(1).
- To study the spectrum of organisms causing necrotizing fasciitis and their antibiotic sensitivity.
- To study the occurrence of necrotizing fasciitis in various anatomical sites.

### EPIDEMIOLOGY

There is no age or sex predilection for necrotizing fasciitis. The disease occurs more frequently in diabetics, alcoholics, immunosuppressed patients, IV drug users and patients with peripheral vascular disease . However, necrotizing fasciitis also occurs in young and healthy individuals. In this population the pathogenic organism is commonly virulent strain of group A beta hemolytic streptococcus, with the clinical presentation commonly being that of streptococcal toxic shock syndrome(2).

### Microbiology of Necrotizing Soft Tissue Infections

No single organism is responsible for the fascial necrosis and systemic toxicity seen in necrotizing fasciitis. In fact, the synergistic action of facultative aerobic and anaerobic bacteria could be responsible for the often fulminant course of the disease-(3).

Giuliano et al divided bacteriologic culture results seen in necrotizing fasciitis into two distinct groups. Type I is polymicrobial and involves non-group A streptococci plus anaerobes and/or facultative anaerobes, often with involvement of enterobacteriaceae(4). Organism commonly identified include aerobic and anaerobic streptococci, coagulase-negative and coagulase-positive staphylococci, facultative and aerobic Gram-negative rods, Bacteriodes species, and Clostridium species. Facultative organisms lower the oxidation-reduction potential of the wound microenvironment and promote favourable conditions for the growth of anaerobes. Anaerobes interfere with host phagocyte function and thereby facilitate the proliferation of aerobic bacteria. Several bacteria such as Bacteriodes fragilis, produce -lactamase enzymes that interfere with antibiotic activity. In type 2, also known as hemolytic streptococcal gangrene(5), the pathogen is group A beta-hemolytic streptococci alone or in combination with a staphylococcus. As many as 11 organisms were isolated from each patient in their series. Of the anaerobic species isolated, none was present as the sole organism. No differences in clinical course, morbidity or mortality were demonstrated between

the groups. Other studies support the findings of Giuliano et al.

The number and type of organisms present in necrotizing fasciitis tend to depend on the site of infection. Abdominal and perineal infections, particularly postoperatively, tend to be polymicrobial and grow enteric pathogens (type 1 in the classification of Giuliano et al). These postoperative infections grow an average of three bacterial isolates. The predominant organisms in these polymicrobial infections are aerobic and anaerobic Gram-negative enteric bacilli, enterococci and less commonly, staphylococcal and streptococcal species(5). The anaerobes include Bacteriodes and clostridial species.

Extremity lesions more commonly are monomicrobial and involve skin flora (type 2 in the classification of Giuliano et al). Almost half of the monomicrobial infections described by McHenry et al were caused by S.pyogenes whereas S pyogenes was isolated from only 2 of 45 patients with polymicrobial infections.

A third type of necrotizing fasciitis is caused by the marine Vibrios (Gramnegative rods), particularly Vibrio vulnifitcus, Vibrio parahemolyticus, Vibrio damsela, and Vibrio alginolyticus. Vibrio vulnifitcus is believed to be the most virulent. The usual portal of entry is a puncture wound caused by a fish or a cut or insect bite exposed to sea water, shellfish or fish in tropical waters. The pathogenic vibrios are believed to synthesize an extracellular toxin that mediates much of the soft tissue damage in necrotizing fasciitis.

Many case reports have described other pathogens. These include group B Streptococcus, Pasteurella multocida and postoperative infection with Candidal species. There is good correlation between the Gram's stain of surgical or aspirated material from the area of fascial necrosis and organisms eventually cultured. The necrotic centre of the lesion is the preferred site for obtaining culture material and Gram's stain.

The tissue damage and systemic toxicity of necrotizing fasciitis are believed to be due to the release of bacterial toxins and endogenous cytokines. Exotoxins A and B have been implicated in invasive group A streptococcal infections. Exotoxin A has been demonstrated in case of invasive streptococcal A infections whereas it was not present in cases of non-invasive streptococcal A

infections. In addition, Talkington et al found that strains of Streptococcus associated with necrotizing fasciitis and myositis secrete abnormally high levels of cysteine protease dubbed exotoxin B an enzyme that destroys tissue by breaking down protein.

**MATERIALS AND METHOD**

**INCLUSION CRITERIA**

- Patients with a clinical diagnosis of Necrotizing fasciitis were included.
- The study period was from Feb 2010 – Feb 2013 and was prospective in design.
- Patients who were above 18 years of age were included in study.
- The offending organism was identified by a culture swab sent on the first day.
- This was repeated on the 7<sup>th</sup> day and earlier if there was no adequate response to medication.
- The sensitivity of the organisms to the various antibiotics was also studied.
- Patients with Fournier's gangrene were also included in the study.

**EXCLUSION CRITERIA**

- Paediatric population were excluded from our study group.
- Pregnant women were excluded.
- Patients whose initial clinical diagnosis proved to be inaccurate were also excluded.
- Patients who were on concomitant alternate medicine were also excluded.

**OBSERVATIONS**

During the period February 2010 – February 2013, A total of 27 patients were diagnosed to have Necrotizing fasciitis and entered our study group. All patients satisfied the inclusion criteria. The patients included patients from surgical opd.

**DEMOGRAPHICS**

**AGE:** A total of 27 patients with ages ranging from 25-75 years from the study population. The mean age was 49.52 ± 2.4. Maximum number of patients were seen in the 6<sup>th</sup> decade of life.

Age in Years	No. of patients
0-10	0
11-20	0
21-30	2
31-40	3
41-50	7
51-60	10
61-70	3
71-80	2

**GENDER**

While literature shows no gender predilection, our study shows more males than female (74.1%) affected.

**ANATOMICAL SITE OF INVOLVEMENT**

18 patients had Necrotizing fasciitis of the extremities accounting for 66.7% of all the patients. Of these 16 patients had involvement of lower limb. 14.8% had Fournier's gangrene alone (4 patients). 7.4% (2 patients) had extensive fasciitis involving the abdominal wall, perineum and the thigh. One patient had extensive involvement of the chest wall. Others had a combination of various anatomical site.

**INVESTIGATIONS**

**MICROBES AND NECROTIZING FASCIITIS**

All patients in our study group had swabs taken for culture and sensitivity at the time of presentation while broad spectrum antibiotics were started initially, antibiotics were modified according to the sensitivity reports.

Necrotizing fasciitis presents in two forms Necrotizing fasciitis-I which is classically due to mixed group of organisms and

Necrotizing fasciitis-II due to virulent subtypes of Streptococcus.

In our study, we found 63% of patients (17 patients) had multiple organisms(6) grown in culture. (When only a single organism was isolated, Staphylococcus aureus was present in 14.8% of patients, Escheria coli in 11.1% of patients and Streptococcus in 7.4% of patients).

In polymicrobial cultures, Acinetobacter (29.6%), Escheria coli (29.6%), Staphylococcus (23.5%), Enterococci (5.8%), Morganella (23.5%), Streptococci (17.4%) and pseudomonas in (17.64%) were the organisms isolated and cultured.

Anaerobic culture was sent in Robertson's cooked meat media for all patients. No Anaerobes was cultured except for a few bacteroides visualized in 3 samples.

Blood cultures were negative in all patients except one who had Acinetobacter. However there is no correlation as this patient had a wound swab culture of streptococci.

**ANTIBIOTICS**

The antibiotics that were used in most effective(7) (63%) Linezolid in 18.5% of patients and Ciprofloxacin in 11.1% were the other often used antibiotics.

**REVIEW OF LITERATURE**

**AGE & GENDER**

A review of literature states that there is no age or gender predilection for Necrotizing fasciitis. A comparison of our study with others is presented in the tables.

While mean age was 49.5 years in our study it was 51.5 years with David et. at., and 57.8 years with Faucher L.D. et. al. all the studies were comparable in that there was more number of males compared to female. Present study 75% with Rekha et. al. 53%, Faucher L.D. et. al. 51% and David et. al 37%

Mean Age Group In Years	Present study	L.D. Faucher et.al.	David et al.
	49.5	57.8	51.5

**Anatomical site of Involvement**

In our study the most common involved site was extremities found in 66.7% patients, 4(14.8%) patients had Fournier's gangrene, 2(7.4%) had involvement of Abdominal wall, perineum and thigh. 1(3.7%) patient had cervical necrotizing fasciitis, 1(3.7%) had Abdominal wall and perineum involvement. In David et al., Fournier's Gangrene was found in 36% of patients followed by involvement of extremities in 15.2% patients and in L.D.Faucher et al extremity involvement was seen in 51% followed by Abdominal wall in 21% and chest wall in 5% of patients

**Microbiology**

Organisms	Our series	Rekha et al	David et al
Staphylococci	14.8%	12%	
E. coli	11.1%	34%	
Streptococci	7.4%	13%	70%
Proteus		12%	

Staphylococci in their series. Monomicrobial(8) studies was as follows.

63% of patients in our study had multiple organisms in culture while 85% in David's series, 28% in Faucher's series and 29% in Rekha's series had multiple organisms. While an average of 3 organisms were grown in our patients with polymicrobial growth, 4.4 organisms were grown in David et al's series. Acinetobacter and E. coli were the most common organism in polymicrobial cultures in our study. David et al reported Streptococci and Most of our anaerobic cultures were negative. Other studies also do not mention anaerobic cultures.

**Choice of Antibiotics:** Cephalosporins were the most effective

antibiotics(9) in our series. In David et al's series penicillin, metronidazole and aminoglycosides were effective. This reveals the changing spectrum of the antibiotic sensitivity. This is particularly relevant in the present scenario, where there is emerging antibiotic resistance. The duration of usage of the antibiotic ranged from 12.4 days (present study) to 12.8 days (David et al)

### CONCLUSIONS

- Necrotizing fasciitis is an infection more common in people over 40 years of age.
- Necrotizing fasciitis is more common in males compared to the females.
- Necrotising fasciitis is more common at the extremities.
- Infections due to multiple organisms are more common in Necrotizing Fasciitis.
- Causative organisms include *Staphylococcus aureus*, *Streptococci* and *E. coli*.
- The most effective antibiotics regime is Cephalosporins, Aminoglycoside and Metronidazole.

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