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Original research article

A study on clinical profile of patients with necrotising fascitis /cellulitis

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Abstract
Cellulitis is spreading inflammation of skin and subcutaneous tissue which can be managed conservatively if the infection level is not severe and may not need the surgical exploration. However, it is difficult to differentiate NF and cellulitis at the first visit, since the clinical presentation of both disease entities appears similar in the early phase. the patients who came to hospital with history of sudden onset of fever, pain, edema at the affected area was admitted and patient was explained about the condition and after taking consent was subjected for the investigations to check the infection level in blood like CBC, RFT, serum electrolytes, CRP, serum procalcitonin. Serum procalcitonin levels was checked using "ECLIA" (electrochemiluminescence) test. In our study pain was the most common clinical presentation at the time of admission seen in 97.1% of patients, second most common presentation being swelling in 88.6% and followed by other features like redness, Fever, and induration seen in 60%, 57.1% and 57% respectively. Blisters are seen in only 34.3% (12) patients.
Keywords: Necrotising Fascitis, Cellulitis, ECLIA

Introduction
Necrotizing fasciitis (NF) is a severe and life-threatening soft tissue infection characterized by progressive necrosis of the fascia and subcutaneous tissue occurring along the fascial planes. It is more prevalent among those having diabetes mellitus, the immunodeficient status, malnutrition, and illicit drug usage [1] necrotising fasciitis is fatal disease which warrants immediate diagnosis and surgical debridement [2]. The mortality can reach up to 100% if not diagnosed and treated [3]. Patient's clinical characteristics, surgical exploration, microbiological and histopathological analysis of soft tissue are the gold standard for the diagnosis of NF. These tests can be invasive and time-consuming and delay the treatment, increasing the chances of mortality [3]. Majority of infections were polymicrobial (87.5%) [4]. Early and aggressive surgical debridement, often in multiple sittings, supplemented by appropriate antibiotics and supportive therapy, forms the key to a successful outcome in necrotizing fasciitis [5].
Cellulitis is spreading inflammation of skin and subcutaneous tissue which can be managed conservatively if the infection level is not severe and may not need the surgical exploration. However, it is difficult to differentiate NF and cellulitis at the first visit, since the clinical presentation of both disease entities appears similar in the early phase [2].
The availability of the Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) score to diagnose NF was proposed by Wong *et al*. in 2004 [1]. They compared a set of laboratory risk indicators between NF and other soft tissue infections. The total score of the LRINEC ranges from 0 to 13, and the cut off score of 6 was found to have a positive predictive value of 92% and a negative predictive value of 96%.
Procalcitonin (PCT) is a peptide precursor of the hormone Calcitonin, which is involved in calcium homeostasis. The level of PCT increases in response to a proinflammatory stimulus, especially of bacterial origin [4]. During a bacterial infection, PCT is Produced mainly by the cells of the lungs and intestines, which is a reliable marker in the diagnosis and treatment of serious bacterial infections and sepsis [5]. Therefore aim of this study is to use pre-operative serum procalcitonin as a new non- invasive marker for early diagnosis and discrimination of necrotising fasciitis from cellulitis as compared to LRINEC scoring to differentiate the same and to reduce the time delay in treatment of the disease [6].

Methodology
This study was a cross-sectional study. Patients who came under inclusion criteria was subjected to the investigations to support the diagnosis. The investigations done was CBC, RFT, CRP, serum electrolytes, random blood sugars, serum procalcitonin. All Patient was taken for surgery like wound debridement or

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fasciotomy and the tissue sample was sent for culture and sensitivity.and histopathology.

Sampling Size
The sample for the present study consisted of of 35 samples including both the cases of necrotising fasciitis and cellulitis.

Inclusion criteria for sampling
- Patients above 18 years of age
- History of acute onset of fever
- History of acute increase in pain and swelling of the infected area with signs of inflammation
- History of diabetes mellitus.

Exclusion criteria for sampling
- Patients in sepsis Q-sofa score more than 2
- Patient with renal disease
- Patient with burns
- Patient in cardiac shock
- Pregnant women
- Pediatric age group <18 years
- Recent history of other systemic infections

Data collection method
All the patients who came to hospital with history of sudden onset of fever, pain, edema at the affected area was admitted and patient was explained about the condition and after taking consent was subjected for the investigations to check the infection level in blood like CBC, RFT, serum electrolytes, CRP, serum procalcitonin. Serum procalcitonin levels was checked using "ECLIA" (electro chemiluminescence) test. It is based on antigen and antibody reaction test. Then the patient was taken for surgery for wound debridement or fasciotomy and the tissue was sent for culture and sensitivity.and histopathology, the confiramtional diagnosis from culture and sensitivity and histopathology report was compared with pre-operative serum procalcitonin and values were analyzed, the range of value for true positivity for the disease was studied.
Cases with positive histopathology for necrosis was diagnosed as Necrotising Fascitis and histopathology with no necrosis or negative report was diagnosed as cellulitis, and this report was compared with pre-operative serum procalcitonin value and its true positivity and true negativity to differentiate Necrotising fasciitis from cellulitis was studied and also its efficacy was compared with LRINEC scoring system to diagnose NF.

Results

Table 1: Age distribution of patients studied

Age in Years	No. of Patients	%
<50	8	22.9
>50	27	77.1
Total	35	100.0

Mean ± SD: 58.41±10.45

In our study 77.1% of patients were above 50 years and 22.9% of patients were below 50 years

Table 2: Gender distribution of patients studied

Gender	No. of Patients	%
Female	9	25.7
Male	26	74.3
Total	35	100.0

In our study 74.3% of patients wre males and 25.7% wre females, which shows soft tissue infections are more seen in males

Table 3: Location distribution of patients studied

Location	No. of Patients	%
Left LL	12	34.3
Right LL	13	37.1
Left UL	0	0.0

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Right UL	2	5.7
Scrotum	8	22.9
Total	35	100.0

Our study shows extremities are involved more commonly, infections being 37.1% in Right LL and 34.3% in Left LL, then second most common site being scrotum affecting 22.9% of patients.

Table 4: Clinical features on admission

Variables	No. of Patients (n=35)	%
Pain	34	97.1
Swelling	31	88.6
Redness	21	60.0
Fever	20	57.1
Induration	20	57.1
Blister	12	34.3
Skin necrosis	20	57.1

In our study pain was the most common clinical presentation at the time of admission seen in 97.1% of patients, second most common presentation being swelling in 88.6% and followed by other features like redness, Fever, and induration seen in 60%, 57.1% and 57% respectively. Blisters are seen in only 34.3% (12) patients.

Table 5: Total composite score- distribution of patients studied

Total Composite Score	No. of Patients	%
Low Risk	22	62.9
Intermediate Risk	6	17.1
High Risk	7	20.0
Total	35	100.0

According to LRINEC scoring, in our study majority of patients were in low risk group 62.9% (22) patients and only 17.1% (6) in intermediate and 20% (7) in low risk group.

Table 6: Bio-chemical assessment

Variables	No. of Patients	%
CRP		
<15	22	62.9
≥15	13	37.1
Total counts		
<4000	0	0.0
4000-11000	0	0.0
>11000	35	100.0
Hemoglobin		
<11	7	20.0
11-13.5	14	40.0
>13.5	14	40.0
Sodium		
<135	19	54.3
≥135	15	42.9
Creatinine		
≤1.6	33	94.3
>1.6	2	5.7
RBS		
≤180	26	74.3
>180	9	25.7

In our study 62.9% (22) patients CRP was below 15 and 37.1% (13) was baove 15 and all patients (35) had total counts above 11,000/mm^3. Anemia was seen only in 20% (7). Hyponatremia <135 was seen in 54.3% (19) patients and high creatinine >1.6 mg/dl was seen in only 5.7% (2) patients. High sugars was seen in only 25.7% (9) patients.

Table 7: Comparison of clinical variables according to total composite score of patients studied

Variables	Total Composite Score			Total	P Value
	Low Risk	Intermediate Risk	High Risk		
CRP	9.86±3.14	15.17±1.72	17.43±2.3	12.29±4.26	<0.001**
Total counts	14791.23±2555.12	20984.17±3472.42	19686.57±4397.17	16831.94±4078.31	<0.001**

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Hemoglobin	12.86±1.75	11.33±1.97	11.29±1.89	12.29±1.92	0.064+
Sodium	134.64±3.4	132.5±4.28	130.14±1.77	133.37±3.7	0.012*
Creatinine	0.79±0.35	1.05±0.27	1.09±0.51	0.89±0.39	0.115
RBS	150.59±41.88	139.67±30	179.14±44.61	154.43±41.72	0.186

Discussion

Prompt diagnosis, adequate support to maintain vital functions, as well as thorough and frequent surgical debridement are the mainstay for achieving a successful outcome. A US study indicated that aggressive surgical debridement at the outset was associated with a mortality rate of 4.2%, versus 38% after delayed treatment (P=0.0007). In another US study, 17 of 29 patients who underwent early operation (within 24 hours of admission) had a 6% mortality, while after delayed surgery it was 25%. The timing of the first fasciotomy within 24 hours of injury enhanced survival when compared to later surgery (hospital mortality 5% vs 23%, P=0.005).

Patients should be taken to theatre without delay and have aggressive surgical debridement. Surgeons should make incisions to the deep fascia (this may reveal the presence of "murky dishwater fluid" in the wound), and all non-viable tissue including fascia should be excised. Further surgical exploration 24-48 hours later is mandatory to ensure that the infectious process has not extended. Repeated debridements may be necessary (as dictated by the state of the wound) until the infection has been controlled adequately [7].

Aggressive surgery removes the source of infection and toxins, and removal of infarcted tissue improves the penetration of antibiotics.

Inadequate or delayed surgery was associated with a mortality of 38% (8/21), compared with a mortality of only 4.2% (2/48) in those who underwent aggressive surgery at recognition (P - 0.0007). Delaying surgery by 24 h increased the mortality associated with Vibrio spp. NF from 35% to 53%, with 100% mortality if surgery was not performed within 3 days. In a study, eleven of 12 patients where surgery was delayed more than 12 h died, whereas a 24 h delay resulted in a quadrupling of mortality in another study [8].

Extensive debridement produces large areas that need covering. Negative pressure therapy [vacuum-assisted closure or (VAC) dressing] with a continuous pressure of 40 to100 mmHg is useful for wound coverage and encourages granulation before and after skin grafting [9].

Topical negative pressure (TNP) therapy is another technique that can be used to manage these wounds. It will reduce edema fluid and stimulate granulation tissue formation as a result of the applied tension forces. Krasner has also suggested that this technique may reduce wound pain and the discomfort associated with dressing changes. TNP has also been shown to minimise bacterial growth and has an added benefit of reverse tissue expansion which may dramatically aid in the closure of the resultant defect [10].

Necrotising fasciitis is an uncommon, but life threatening, condition with a high associated mortality and morbidity. Reported mortality varies from 6% to 76%, but more recent studies report this to be much lower, at around 25% [7].

Due to difficulties in diagnosing necrotising fasciitis, the condition is associated with high rates of morbidity and mortality. An Australian study reported that out of 14 patients, 93% were admitted to the ICU, 79% required mechanical ventilation, and 71% received inotropic support [9]. Despite efforts to treat the rapid infective process, many patients still die through complications of sepsis (pneumonia, heart failure, and metabolic disturbance). The mortality rate of necrotising fasciitis ranges from 20 to 75% [9].

Conclusion

In our study, the components of LRINEC scoring were as follows:

CRP value increased from 9 to 17 mg/dl from low risk to high risk group, with significant P value of <0.001. similarly the total counts also raised with mean value of 147791 to 19,686/ mm^3 from low to high risk group with significant P value of <0.001. However there was no much difference in change of components like HB, creatinine and blood sugars. There was significant hyponatremia seen in high risk group of mean 133 meq/l with P value of 0.012.

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