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A STUDY TO ASSESS THE LEVEL OF SUSPICION OF NECROTIZING FASCIITIS IN PATIENTS WITH CELLULITIS OF LOWER LIMB USING MODIFIED LRINEC SCORE IN A TERTIARY CENTRE IN KERALA

General Surgery

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ABSTRACT

Background: Cellulitis is a spreading inflammation of the subcutaneous and fascial tissues, characterized by erythema, swelling, warmth, and pain. Necrotizing fasciitis is a rare but rapidly progressive devastating soft tissue necrosis that usually involves fascia and subcutaneous tissues with a significant hospital morbidity and mortality. Necrotizing fasciitis is a differential diagnosis of extensive cellulitis but a highly fatal condition. If we are able to clinically asses the patient at the time of presentation along with the laboratory parameters risk stratification can be done. Aims and **Objectives:** This study assesses the level of suspicion of Necrotizing fasciitis in patients with cellulitis of the lower limb using Modified LRINEC score. **Materials & Methods:** The study was a cross sectional study involving 787 patients conducted in the department of General Surgery of Dr.Somervell Memorial CSI Medical College, Karakonam,Trivandrum during a period of 18 months. All the patients clinically diagnosed as cellulitis of lower limb were the study subjects and routine investigations were done. **Results:** In the present study 787 patients who presented with lower limb cellulitis were included and modified LRINEC Score was calculated. The average modified LRINEC score was 3.5122. Out of 433 patients with random blood sugar value of more than 180mg/dL, in only 0.7% of patients and out of 399 patients with a history of trauma, in only 5.3% of patients, there was a strong suspicion of necrotizing fasciitis. **Conclusion:** In patients presenting with cellulitis, there is a high chance of progression of the disease to involve the deep fascia and result in necrotizing soft tissue infections. Modified Laboratory Risk Indicators for Necrotizing Fasciitis (M-LRINEC) score helps in risk stratification of the patient.

KEYWORDS

Cellulitis, necrotizing fasciitis, LRINEC score

INTRODUCTION

Cellulitis is a spreading inflammation of the subcutaneous and fascial tissues leading to suppuration, sloughing or even gangrene (especially in cases of diabetes) of the affected part. [1] Cellulitis is an inflammatory condition of the skin and subcutaneous tissue, characterized by erythema, swelling, warmth, and pain. The etiologic agents are most often *Streptococcus pyogenes* and *Staphylococcus aureus*, followed by non—group A β-hemolytic streptococci and gram-negative bacilli.[2]

The affected part will be warm, tender, erythematous and swollen. It may or may not follow an accidental injury and the organism usually gains access through this, however trivial the injury might be. An aging population and obesity have both contributed to a rising incidence of lower limb cellulitis; the most important predisposing factors include older age, obesity, venous insufficiency, saphenous venectomy, and edema.[3]

Necrotizing fasciitis is a rare but rapidly progressive devastating soft tissue necrosis that usually involves fascia and subcutaneous tissues with a significant hospital morbidity and mortality.[4] Many types of bacteria can cause NF, among which group A Streptococci are most common. However, (methicillin-resistant) *Staphylocyoccus aureus* (MRSA), *Clostridium perfringens*, *Bacteriodiesfragiles* as well as Gram-negative bacteria have also been detected.[5]The patient presents fever, erythema and pain. Eventually blisters develop on an erythematous, tender lower limb. Necrotising Fasciitis is rapidly progressing and leads to severe, life threatening situations and requires immediate antibiotic intravenous administration and surgical debridement even before the pathogen can be identified. [6-8]

Necrotizing fasciitis is a differential diagnosis of extensive cellulitis but a highly fatal condition. Necrotizing fasciitis is often confused for cellulitis at initial presentation and is considered to be more severe.[9]If we are able to clinically asses the patient at the time of presentation along with the laboratory parameters risk stratification can be done. Once the patients with high suspicion are identified, the treatment protocol or even the modality can be changed for a better outcome.

Necrotizing fasciitis can manifest with bullae, skin necrosis, pain beyond the margins of erythema, crepitus, gas on imaging, hypotension or other signs of Systemic inflammatory Response Syndrome (SIRS). Due to substantial morbidity and mortality associated with these infections, the threshold for surgical exploration should be low particularly in a weakened host, such as diabetic patients, the malnourished, alcoholics, neutropenic or functionally neutropenic patients, cirrhotic patients, renal failure patients and individuals with peripheral vascular disease. [10]

MATERIALS AND METHODS

This was a Cross sectional study a study conducted in the department of General Surgery of Dr.Somervell Memorial CSI Medical College, Karakonam,Trivandrum conducted for a time period of 8 months from 10-10-2019 to 12-3-2021. All the patients clinically diagnosed as cellulitis of lower limb who provided consent for the study were the study subjects. The sample size was 800. Level of suspicion of Necrotizing fasciitis based on modified LRINEC score, age sex, co morbidities, history of trauma, Random Blood Sugar, HbA1c, C reactive protein, Fibrinogen levels, Serum Sodium level, Serum Creatinine, Total White blood cell count, Erythrocyte count was assessed using a semistructured proforma containing 3 sections Patient details, Contributory factor and Clinical and Laboratory Assessment

Modified LRINEC score with clinical symptoms

Laboratory Parameters		
C Reactive protein	>150 mg/dl	4 points
Total white cell count (WBC)	<15 x 106/mm3 15-25 x 106/mm3 >25 x 106/mm3	0point 1 point 2 points
Erythrocyte count	<4 x 1061 point	
Haemoglobin	>13.5 g/dl 11-13.5 g/dl <11 g/dl	0 point 1 point 2 points
Creatinine	<140 mmol/L	2 points
Fibrinogen levels	>750 mg/dl	2 points
Clinical Parameters		
Pain	Mild/none Intermediate Strong	0 point 1 point 2 points
Fever	<37.5 0 C 37.6 – 37.9 0 C >380 C	0 point 1 point 2 points

Tachycardia	100 heart beats/min	1 point
Signs of acute renal injury	No Yes	0 point 1 point
Sum		

Score Results : -
≥8 – strong suspicion for Necrotizing Fasciitis
6-7 – suspicion for Necrotizing Fasciitis
≤5 – no suspicion for Necrotizing Fasciitis

RESULTS

Table 1. Gender Distribution of the sample

Gender	Count	Percent
Male	468	59.5
Female	319	40.5

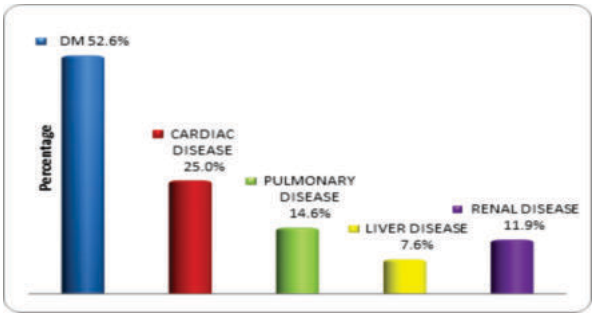

Figure 1. Percentage distribution of the sample according to co morbidities

Table 2. Percentage distribution of the sample according to Modified LRINEC score

Modified LRINEC score	Count	Percent
Strong suspicion for Necrotizing Fasciitis	50	6.4
Suspicion for Necrotizing Fasciitis	115	14.6
No suspicion for Necrotizing Fasciitis	622	79.0

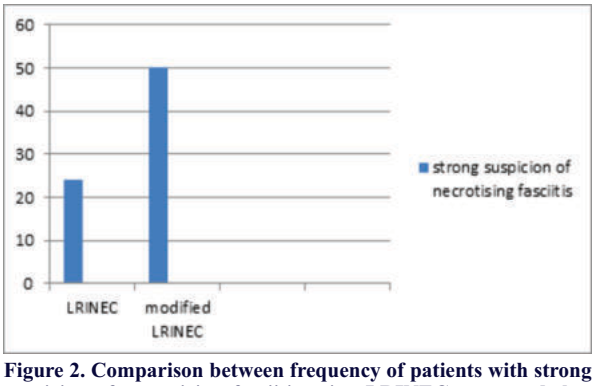

Figure 2. Comparison between frequency of patients with strong suspicion of necrotizing fasciitis using LRINEC score and that using modified LRINEC score.

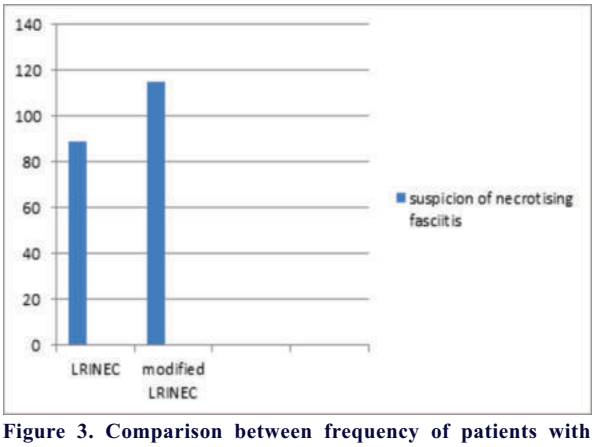

Figure 3. Comparison between frequency of patients with suspicion of necrotizing fasciitis using LRINEC score and that using modified LRINEC score.

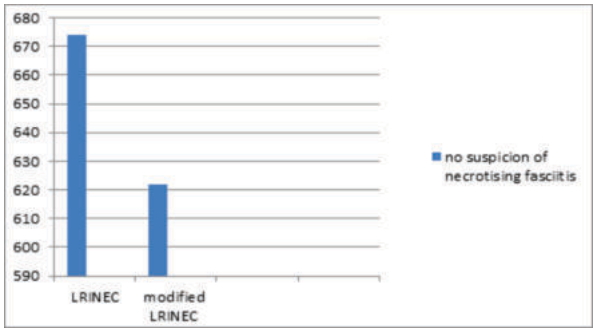

Figure 4. Comparison between frequency of patients with no suspicion of necrotizing fasciitis using LRINEC score and that using modified LRINEC score.

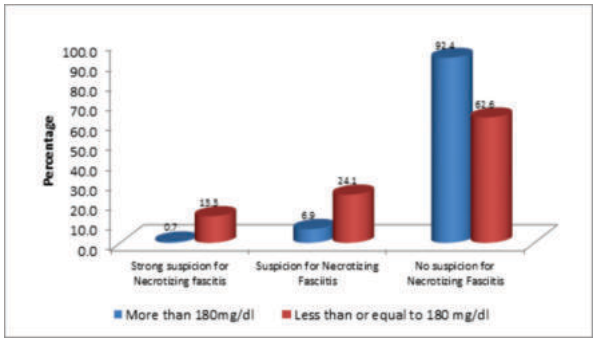

Figure 5. Association of Modified LRINEC score and RBS in patients with cellulitis of the lower limb

DISCUSSION

Necrotizing fasciitis is an uncommon but rapidly progressive infection that results in gross morbidity and mortality if not treated in early stages.[1] Modified LRINEC score is used to distinguish between necrotizing fasciitis from other infections such as cellulitis and abscess. Acute bacterial cellulitis is potentially serious infection that commonly recurs. [3] It may at times mimic a more serious and fatal condition like necrotizing fasciitis.

In the present study the inclusion criteria involved patients with lower limb cellulitis and the risk of developing necrotizing fasciitis was assessed by modified LRINEC score. In a study conducted by Borschitz et a, two comparative groups were studied: one group with established necrotizing fasciitis and the other group with cellulitis with a duration of hospital stay more than 10 days. In Necrotizing fasciitis group the disease localization varied while in cellulitis group the disease was primarily in lower limb (70%). 18 out of 29 cases of necrotizing fasciitis presented with strong pain whereas only 14 out of 59 patients with cellulitis presented with intermediate pain; strong pain was not documented in any case of cellulitis. In my study, 402 patients out of 787 patients which is 51.1% of the study population had intermediate pain and 376 out of 787 patients which is 47.8% of the study population had strong pain. The differences in the clinical presentation of skin involvement in necrotizing fasciitis as compared to cellulitis were not dramatic and highlight the difficulties in differentiating necrotizing fasciitis from cellulitis clinically in an early stage. In cellulitis patients, in only 7% of patients, there was a strong suspicion for necrotizing fasciitis, in 3% patient here was suspicion of necrotizing fasciitis and in 90% of patients there was no suspicion of necrotizing fasciitis.[5] In the present study, in only 3% of patients there was a strong suspicion for necrotizing fasciitis, in 11.3% patients there was suspicion for necrotizing fasciitis while in the remaining 85.6% there was no suspicion of necrotizing fasciitis when LRINEC score was used. The study by Borshcitz also highlights on the importance of using CRP as a valuable laboratory parameter to assess the risk of necrotizing fasciitis. When modified LRINEC score was used, the positive predictive value increased and negative predictive value was decreased.[4]

In the present study all the patients 787 who presented with lower limb cellulitis were included and in these patients a risk assessment was done. In a similar study done by Cranendonk et al. in 2017, 54 patients who presented with cellulitis and necrotizing fasciitis were included in

the study and it was also found out that the patients with cellulitis had more co-morbidities, especially cardiovascular insufficiency, as compared to those with necrotizing fasciitis but at the same time those with necrotizing fasciitis patients had higher SOFA score and the rate of shock. The study also showed that the rate of ICU admission was also less for cellulitis patients. [12] In my study the patients with strong suspicion for necrotizing fasciitis were 50 which is only 6.4% of the study population when modified LRINEC score was used. Thus it can be concluded that the majority of the patient who presents to us with lower limb cellulitis will not be having deeper soft tissue infection and can be managed in the general ward with intravenous antibiotics and other supportive medications without any need for intensive care and mechanical ventilation. [5]

In the present study, including 787 patients with lower limb cellulitis, 59.5% were males and 40.5% were females. 52.6% of the patients had diabetes mellitus, 38.5% had pyrexia of more than 37.5°C and 50.7% patients had a history of trauma. In a similar study by Magela et al., out of 35 patients with necrotizing fasciitis, in 49% of the cases, lower limb was affected. 74% of the patients were males and 26% were females. 6% of the patients had diabetes mellitus, 69% had pyrexia of more than 37.5°C and 31% patients had a history of trauma. [11]

Similarly in a study conducted by Tan et al. in 2016, out of the total 127 patients with surgically proved necrotizing fasciitis 78 (61.4%) were diabetic and 49 (38.6%) were non-diabetic. In the study those patients with diabetes tend to have polymicrobial infection and carried a poorer prognosis.[14] it can be said that diabetes mellitus is a risk factor for deep soft tissue infections and that the progression is disproportionately faster and involves gram positive, gram negative and aneorobic organisms. The control of blood sugar levels, thus play a vital role in the control and prognosis of the disease. [13]

CONCLUSION

Necrotizing fasciitis is a close differential diagnosis of severe form of cellulitis. In patients presenting with cellulitis, there is a high chance of progression of the disease to involve the deep fascia and result in necrotizing soft tissue infections. An early clinical suspicion plays a key role in identifying the disease and in planning the management accordingly. The use of a scoring system like Modified Laboratory Risk Indicators for Necrotizing Fasciitis (M-LRINEC) score helps in risk stratification of the patient. However, it should be kept in mind that the score should be used with caution as a routine diagnostic tool especially in cases where the patient presents to the emergency department. Patients with cellulitis can be managed with Intravenous antibiotics and other supportive measures alone in most of the situations. However, necrotizing fasciitis is a rapidly progressing disease that requires admission in the intensive care unit and surgical interventions like radical wound debridement and in severe cases, even amputation of the limb. Diabetic patients and immunocompromised patients, in general, present late and carries even worse prognosis. The mortality rate of necrotizing fasciitis is high as it is rapidly progressing. Post operatively, patient may be mechanically ventilated and may end up in septic shock and eventual fatality. Therefore early identification and intervention determines the prognosis of the condition. Prospective comparative studies comparing the M-LRINEC score with other diagnostic tools may be needed in the future.

Summary

A hospital-based cross-sectional study was conducted on 787 patients with lower limb cellulitis., 59.5% were males and 40.5% were females. The average modified LRINEC score was 3.5122. The most common co-morbidity was diabetes mellitus which was present in 52.6% of the patients. 38.5% had pyrexia of more than 37.5°C and 50.7% patients had a history of trauma. Among the study population, out of 433 patients with random blood sugar value of more than 180mg/dL only in 0.7% of patients there was a strong suspicion of necrotizing fasciitis and out of 399 patients with a history of trauma only in 5.3% of patients there was a strong suspicion of necrotizing fasciitis. There was a strong suspicion of necrotizing fasciitis in 24 patients when LRINEC score was used and in 50 patients when modified LRINEC score was used. Since M-LRINEC score includes more clinical and laboratory parameters the validity of the modified score can be considered more. The use of a scoring system like Modified Laboratory Risk Indicators for Necrotizing Fasciitis (M-LRINEC) score helps in risk stratification of the patient. However, the score should be used with caution as a routine diagnostic tool especially in cases where the patient presents to the emergency department. Necrotizing fasciitis is a rapidly progressing disease that requires admission in the intensive care unit, intravenous antibiotics and radical wound debridement. Investigations and scoring should not delay the definitive treatment. Prospective comparative studies comparing the M-LRINEC score with other diagnostic tools may be needed in the future.

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