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Original Research Article

Laboratory risk indicator for necrotizing fasciitis: an objective scoring system as a tool for early diagnosis of necrotizing fasciitis

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ABSTRACT

Background: Necrotizing soft tissue infections are often fatal, characterized by extensive necrosis of the subcutaneous tissues and fascia. The mortality of 30-40% reflects the inadequacy of early recognition of necrotizing soft tissue infections. This study emphasizes on the search for a tool that reliably and rapidly identifies patients with NF. An objective of current study was to validate the LRINEC score as a tool for early distinguishing of necrotizing fasciitis from other soft tissue infections.
Methods: Prospective clinical study analysis of outcome of sixty of patients with soft tissue infections were evaluated based on LRINEC. Based on their LRINEC score, the patients were categorized as low, intermediate and high risk for the onset of necrotizing fasciitis.
Results: A total of 60 patients with soft tissue infections were prospectively evaluated and categorized on the basis of LRINEC score 45 patients in low risk category, 7 in Intermediate risk and 8 patients in high risk group. In terms of outcome, all cases (including positive tissue diagnosis cases) in low risk and intermediate risk groups and 2 cases in high risk group were improved with surgical debridement/fasciotomy. The cutoff of LRINEC ≥6 has better sensitivity and specificity in identifying the risk of the patient.
Conclusions: LRINEC scoring system has a better positive predictive value in identifying the onset and risk strategizing of necrotizing fasciitis.

Keywords: Necrotizing fasciitis, Laboratory risk indicator for necrotizing fasciitis, Scoring system

INTRODUCTION

Necrotising soft tissue infections have been recognised and reported for centuries, the earliest dating back to Hippocrates in the 5th century BC when he wrote, many were attacked by the erysipelas all over the body when the exciting cause was a trivial accident flesh, sinews, and bones fell away in large quantities there were many deaths.[1,2]

Such infections represent a large spectrum of clinical entities, ranging from mild pyodermas to life threatening necrotising fasciitis. Although these infections are most commonly caused by streptococcal and staphylococcal species, a multitude of other organisms have also been implicated.[3]

The term necrotising fasciitis was first used by Wilson in 1952 to describe the most consistent feature of the infection, necrosis of the fascia and subcutaneous tissue with relative sparing of the underlying muscle.[4] It can progress rapidly to systemic toxicity and even death if not promptly diagnosed and treated. Once suspected, management should consist of immediate resuscitation, early surgical debridement, and administration of broad spectrum intravenous antibiotics.

When a patient presents with soft tissue infection, the clinician faces the challenge of establishing a specific diagnosis and prescribing definitive treatment. Since it is part of a spectrum of necrotising soft tissue infections, diagnosis can certainly be difficult for people who are unfamiliar with the condition and treatment may be delayed. This may be compounded by the relative lack of clinical signs and symptoms during the early course of the infection and because surgical consultation is sought only once the diagnosis is obvious and the signs of sepsis are readily apparent. Unfortunately, most adverse outcomes result from this delay in diagnosis.[5]

Necrotizing soft tissue infections are often fatal, characterized by extensive necrosis of the subcutaneous tissues and fascia. Perhaps it is the most severe form of soft tissue infection potentially limb and life threatening. These infections often are mistaken for cellulitis or innocent wound infections and hence, diagnostic delay. Inspite of advances in antibiotic therapy and intensive care, the mortality of necrotizing soft tissue infections is still high. The reported mortality of 20% as in with the case of a study in Germany reflects the inadequacy of early recognition of Necrotizing soft tissue infections.[6,7] Necrotizing fasciitis is a surgical emergency. It has a poor outcome after late operative intervention but the clinical diagnosis is difficult. The laboratory risk indicator for necrotizing fasciitis (LRINEC) score was first introduced in 2004 and several clinicians have suggested it is useful for early recognition of necrotizing fasciitis but its validation still needs to be examined.[8]

Aims and objectives

Aim and objectives of the current study to validate the LRINEC score as a tool for early distinguishing of necrotizing fasciitis from other infections of the soft tissues, to evaluate whether risk categorization using LRINEC score is appropriate and to identify the significance of LRINEC score in predicting the clinical outcomes.

METHODS

A Prospective Observational study was conducted analyzing 60 patients in MVJ medical college and research hospital from November 2020 to November 2021 (12 months) among patients admitted to the surgical wards with severe soft tissue infections. Age, sex, clinical manifestations, site and etiology of infection, predisposing factors, comorbidities, vital signs, laboratory parameters at the time of admission, medication being taken at the time of admission and microbiology of wound and blood cultures had been recorded. Aggressive surgical debridement, culture of pus, tissue biopsy, radiological imaging, antibiotic therapy, treatment of complication, amputation or skin grafting were strategized for management. The interval between contact and admission, LRINEC score, risk categorization, time interval between admission and first surgery, the number of surgical procedures, the need for amputation, the length of hospital stay and the mortality rate had been documented. All variables were statistically analyzed further to evaluate the significance of LRINEC score in predicting the clinical outcomes.

Inclusion criteria

All patients above 18 years of age with severe soft tissue infections were included in the study.

Exclusion criteria

All the patients with age ≤18 years age, patients referred from other institutions, patients who needs multiple admissions due to soft tissue infection, only the first admission be considered, patients with features of necrotizing fasciitis on presentation and patients with surgical site infections.

Statistics

Results were expressed as mean±SE based on based on analysis of 60 patients of necrotizing soft tissue infections admitted to MVJ medical college and research hospital from November 2020 to November 2021 (12 months). All variables were statistically analysed further to evaluate the significance of LRINEC score in predicting the clinical outcomes.

RESULTS

Total of 60 patients with soft tissue infections were included in this study. They were evaluated based on laboratory risk indicator for necrotizing fasciitis. Based on their LRINEC score, the patients were categorized as low, intermediate and high risk for the onset of necrotizingfasciitis. 45 patients in low-risk category, 7 in Intermediate risk and 8 patients in high-risk group (Figure 1). This study included forty-two males (70%) and eighteen females (30%) (Figure 2).

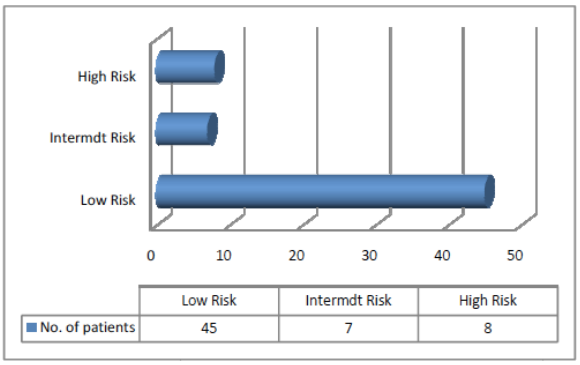

Figure 1: Demographics.

In terms of outcome, forty-five patients in low-risk categories had their soft tissue infection regressed with iv

antibiotics, anti-inflammatory measures, Limb elevation in 22 cases and surgical debridement in 23 cases. Of them, Skin grafts were applied in eight patients. All seven patients in intermediate risk were improved with no morbidity or mortality. Three of them required split skin graft. Three of eight patients in high-risk category improved with multiple surgical debridements along with graft application. Two patients required amputation and three died despite all resuscitative measures (Figure 3).

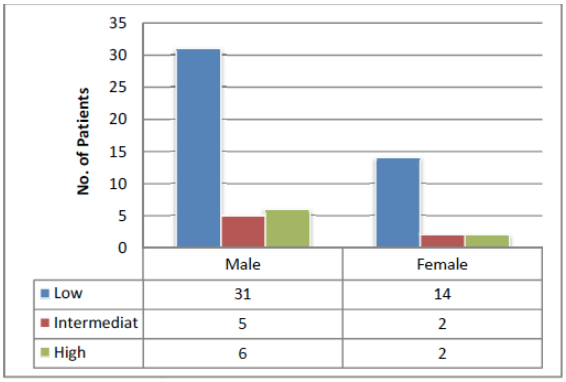

Figure 2: Gender-wise distribution.

Among the Patients studied, about 78% of the patients had their illness of spontaneous onset and 22% had a preceding history of injury, more often athorn/nail prick or a road traffic accident or a history of fall (Figure 1). There is no statistically significant difference between the mean age between the groups of severity.The mean age was 55.3 years (Figure 4). Out of all the comorbidities diabetes mellitus was the most frequent predisposing factor followed by chronic renal failure (Figure 5).

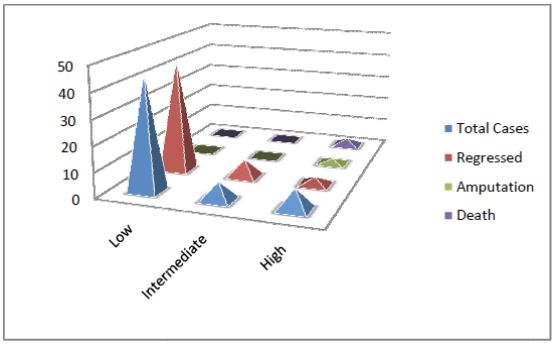

Figure 3: Outcome in each category.

The cutoff of LRINEC ≥6 has better sensitivity and specificity in identifying the risk of the patient for necrotizing fasciitis. LRINEC scoring system has a better sensitivity and positive predictive value in identifying the onset of necrotizing fasciitis in soft tissue infections.

DISCUSSION

Necrotizing fasciitis (NF) is a well-defined, persistent, and pervasive disease in which the fascia is the primary site of infection. Necrotizing fasciitis has been described in medical texts since 1871 and in the surgical literature since 1924.[9,10] In many cases, the inciting factors are not identified. Hard clinical signs, such as crepitance, bullae, necrosis, and subcutaneous air on radiographs, help to establish the diagnosis; however, these signs are often not present at the time of initial examination.[11]

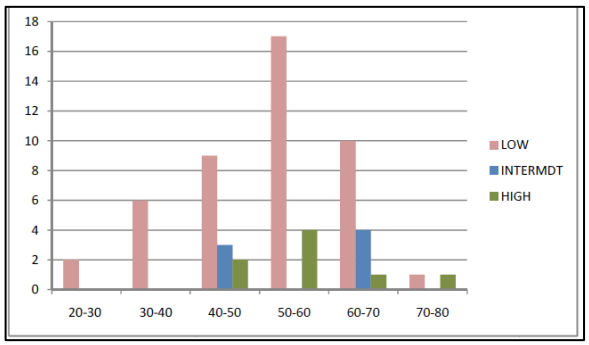

Figure 4: Age-wise distribution.

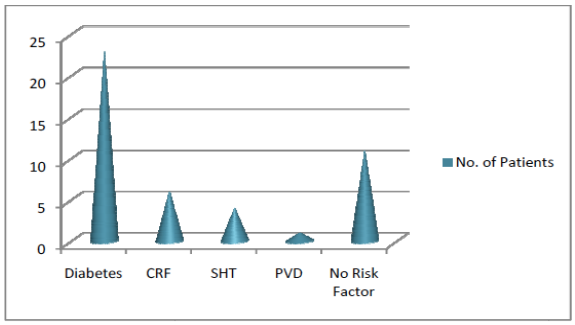

Figure 5: Patients with co-morbid factors: diabetes mellitus, chronic renal failure (CRF), systemic hypertension (SHT), peripheral vascular disease (PVD).

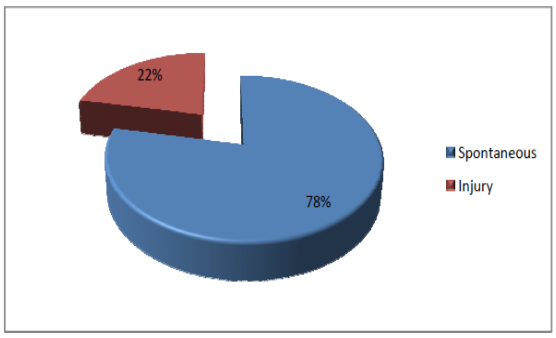

Figure 6: Etiology of soft tissue infections.

Although the exact incidence of these infections in the general population is unknown, they are among the most common infections occurring in all age groups. The mortality associated with NSTI has been in the range of 16% to 45%. Thus, a validated reliable scoring system is a need of the hour.[12] Bilton et al noted that patients undergoing early and aggressive therapy had a mortality of 4.2% as compared with 38% mortality with delayed or

inadequate preliminary therapy.[13] Thus a validated, reliable and repeatable scoring system is a necessity to add to a surgeons armoire. The LRINEC score is calculated based on points assigned for six laboratory variables at the time of presentation including: C-reactive protein, hemoglobin, total leukocyte count, serum glucose, serum sodium, serumcreatinine (Table 1).[14]

Table 1: Laboratory risk indicator for necrotizing fasciitis score.

Variable	Score
C-reactive protein mg/dl	
<150	0
≥150	4
White cell count per mm^3	
<15	0
15-25	1
>25	2
Hemoglobin g/dl	
>13.5	0
11-13.5	1
<11	2
Sodium mmol/l	
≥135	0
<135	2
Creatinine mg/dl	
≤1.6	0
>1.6	2
Glucose mg/dl	
≤180	0
>180	1
Maximum score 13	

The maximum score is 13. LRINEC score inference, ≥6 suspicious of NF, ≥8, strong prediction of NF.[13-15] The LRINEC score stratifies patients with soft tissue infection into low, moderate, and high-risk categories of necrotizing fasciitis even when the clinical picture is equivocal and thus guides us in better understanding and approaching this disease appropriately. Swain et al retrospectively studied patients with necrotising fasciitis over a five-year period, recruiting 15 patients with the disease between 2006 and 2011. Of these patients, the mean LRINEC score varied for patients who survived and those who died. The LRINEC score was comparatively higher for patients who died (LRINEC 9) versus those who survived (LRINEC 6.5) with necrotising fasciitis.[7] The paper also examined the comorbidities associated with necrotising fasciitis. The authors found the highest associated comorbidities were diabetes, hypertension, obesity and hypercholestero-laemia.[7] Similarly in our study, p value=0.001 reveals that there is an association between diabetes mellitus and the severity of risk.

However, LRINEC had poor sensitivity, and should not be used to rule-out NSTI. Given the poor sensitivity of these tests, a high clinical suspicion warrants early surgical consultation for definitive diagnosis and management.[16] Finally, laboratory risk indicator for necrotizing fasciitis score can be used as an adjunct in the management of soft tissue infection especially in secondary care hospitals and may prevent delayed referral to tertiary centres where experienced surgeons, infectious disease and hyperbarics pecialists may guide immediate operative and ancillary management, thereby improving the clinical outcome of the patient.

Limitations

The significance of LRINEC score in predicting the clinical outcome of the disease could not be outlined because of limited population included in this study. Further studies are needed to determine whether additional interventions targeted to the high mortality risk group can lead to improved outcomes.

CONCLUSION

Necrotizing soft tissue infections are often fatal, characterized by extensive necrosis of the fascia and subcutaneous tissues. It is perhaps the most severe form of soft tissue infection potentially limb and life threatening. Early diagnosis of necrotizing fasciitis is essential to advocate timely management for the better wellbeing of the patient. LRINEC score is based on routine laboratory investigations that are readily available, at most centers that can help distinguish Necrotizing Fasciitis from other soft tissue infections. LRINEC scoring system has a better positive predictive value in identifying the onset of necrotizing fasciitis and risk strategizing of the patients with severe soft tissue infections.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Descamps V, Aitken J, Lee MG. Hippocrates on necrotising fasciitis. Lancet. 1994;344:556.
2. Sarani B, Strong M, Pascual J, Schwab CW. Necrotizing fasciitis: current concepts and review of the literature. J Am Coll Surg. 2009;208(2):279-88.
3. File TMJ, Tan JS .Treatment of skin and soft-tissue infections. Am J Surg. 1995;169(5):27S
4. Wilson B. Necrotising fasciitis. Am Surg. 1952;18:416-31.
5. Lille ST, Sato TT, Engrav LH, Foy H, Jurkovich GJ . Necrotizing soft tissue infections: obstacles in diagnosis. J Am Coll Surg.1996;182:7-11.

6. Ryssel H, Germann G, Riedel K, Köllensperger E. Surgical concept and results of necrotizing fasciitis. Chirurg. 2007;78:1123-9
7. Swain R, Hatcher J, Azadian B et al. A five-year review of necrotizing fasciitis in a tertiary referral unit. Ann R Coll Surg Engl.2013;95: 57-60.
8. Wong CH, Khin LW, Heng KS, Tan KC, Low CO. The Laboratory risk indicator for necrotizing fasciitis) score: a tool for distinguishing necrotizing fasciitis from other soft tissue infections. Crit Care Med. 2004;32(7):1535-41.
9. Jones J. Investigation upon the nature, causes and treatment of hospital gangrene as it prevailed in the confederate armies 1861-1965. New York, U. S. Sanitary Commission. J Am Coll Surg. 1996;182:7-11.
10. Meleney FL. Hemolytic streptococcal gangrene. Arch Surg. 1924;9:317-64.
11. McHenry CR, Piotrowski JJ, Petrinic D, Malangoni MA. Determinants of mortality for necrotizing soft-tissue infections. Ann Surg. 1995;221(5):558-63.
12. Sarani B, Strong M, Pascual J, Schwab CW. Necrotizing fasciitis: current concepts and review of the literature. J Am Coll Surg. 2009;208(2):279-88.
13. Bilton BD, Zibari GB, McMillan RW, Aultman DF, Dunn G, McDonald JC. Aggressive surgical management of necrotizing fasciitis serves to decrease mortality: a retrospective study. Am Surg. 1998;64(5):397-401.
14. Wong CH, Khin LW, Heng KS, Tan KC, Low CO. The LRINEC score: a tool for distinguishing necrotizing fasciitis from other soft tissue infections. Crit Care Med. 2004;32(7):1535-41.
15. Bechar J, Sepehripour S, Hardwicke J, Filobbos G. Laboratory risk indicator for necrotising fasciitis (LRINEC) score for the assessment of early necrotising fasciitis: a systematic review of the literature. Ann R Coll Surg Engl. 2017;99(5):341-6.
16. Liao CI, Lee YK, Su YC, Chuang CH, Wong CH. Validation of the laboratory risk indicator for necrotizing fasciitis (LRINEC) score for early diagnosis of necrotizing fasciitis. Tzu Chi Med J. 2012;24(2):73-6.

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