



## THE LRINEC SCORE – TO PREDICT COURSE AND PROGNOSIS OF NECROTIZING FASCIITIS

## General Surgery

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| <b>Dr Pranav Batra</b>        | Post Graduate Resident, Dept Of General Surgery, Belagavi Institute Of Medical Sciences, Belagavi, Karnataka, India-590001                    |
| <b>Dr Ravishankar-kumar G</b> | Associate Professor, Dept Of General Surgery, Belagavi Institute Of Medical Sciences, Belagavi, Karnataka, India-590001                       |
| <b>Dr Sandeep Reddy*</b>      | Assistant Professor, Dept Of General Surgery, Belagavi Institute Of Medical Sciences, Belagavi, Karnataka, India-590001 *Corresponding Author |

## ABSTRACT

Necrotizing fasciitis (NF) is a severe, rapidly progressing infection characterized by necrosis of subcutaneous and deep fascial tissues, leading to significant morbidity and high mortality rates. This study assesses the Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) score as a predictor of mortality and outcome in patients with NF. **Methods:** Conducted over six months, this prospective observational study evaluated 93 patients diagnosed with NF, analyzing LRINEC scores at admission and post-debridement to determine their correlation with mortality and clinical outcomes. **Result:** The overall lethality during our study was 19 out of 93 (20.4%). A highly significant LRINEC decrease was found for serial debridement. A cut off value of  $>6.5$  (7 LRINEC points) was found to be a predictor of mortality in patients with necrotising fasciitis. **Conclusion:** The LRINEC significantly decreases after surgical debridement. An initial LRINEC equal or greater than seven is an independent prognostic marker for lethality and can help to identify high-risk patients. The results emphasize the value of the LRINEC score as a prognostic tool while also highlighting its limitations as a standalone diagnostic measure.

## KEYWORDS

Necrotizing Fasciitis; LRINEC Score; Mortality Prediction; Debridement; Prognostic Tool.

## INTRODUCTION

Necrotizing fasciitis (NF) is an aggressive, life-threatening soft tissue infection that progresses rapidly, often leading to systemic infection, multi-organ failure, and death if left untreated. The condition frequently affects the lower extremities, trunk, and perineum, with high-risk factors including diabetes, cardiovascular disease, immunosuppression, and advanced age. Identifying high-risk NF patients promptly is critical to preventing lethal outcomes.

Table 1- LRINEC Score<sup>[3]</sup>

| Variable                                    | Value   | Score |
|---------------------------------------------|---------|-------|
| C-Reactive protein (mg/L)                   | $<150$  | 0     |
|                                             | $>150$  | 4     |
| Total white blood cell count (999 cells/uL) | $<15$   | 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     |

TABLE 2- Risk of Necrotising Fascitis

| Risk Category | LRINEC Points | Probability for Presence of NF |
|---------------|---------------|--------------------------------|
| Low           | $\geq 5$      | $<50\%$                        |
| Medium        | 6 to 7        | 50-75%                         |
| High          | $>7$          | $>75\%$                        |

As shown in table 1 and 2, the LRINEC score is a laboratory-based scoring system that measures six parameters: white blood cell count, hemoglobin, sodium, creatinine, glucose, and C-reactive protein (CRP).<sup>[1,2]</sup> While the score has demonstrated promise in distinguishing NF from other soft tissue infections and predicting disease severity, its effectiveness as a prognostic tool for NF remains under scrutiny.<sup>[1]</sup> This study aims to evaluate the LRINEC score's accuracy in predicting mortality and outcomes in NF patients and assess its correlation with post-surgical debridement outcomes.

## PATIENTS AND METHODS

## Study Design

A prospective observational study was conducted over six months at a District Hospital.

## Sample Size

A total of 93 patients with a clinical diagnosis of NF were enrolled, and their LRINEC scores were analyzed at admission and after debridement. Sample size was determined with an expected standard deviation of 2.9, using a 95% confidence level and 0.6 precision.

## Inclusion and Exclusion Criteria

Patients between the ages of 14 and 80 with NF-confirming symptoms, such as intense pain, erythema, and tissue necrosis, were included. Furthermore, intraoperative findings of greyish fascia was taken as confirmation of diagnosis of necrotising fascitis. Exclusion criteria included pregnant females, patients unwilling to participate, and those outside the age range.

## Ethical Clearance

Ethical clearance was taken from institutional ethics committee.

## Data Collection

Each patient's LRINEC score was calculated upon admission and re-evaluated approximately 12 hours post-debridement. Clinical and demographic data were recorded, and outcomes in terms of survival were noted.

## Statistical Analysis

Statistical analyses were conducted using SPSS and Excel. Means, standard deviations, and frequency distributions were employed for descriptive statistics. ROC analysis assessed the LRINEC's prognostic capability, with significance at  $p \leq 0.05$ .

## RESULTS

## Patient Characteristics:

As depicted in figure 1 and 2, the study cohort had a mean age of 52.66 years (SD = 11.53), with 75.3% male participants. Common comorbidities included diabetes (29%), alcohol use disorder (21.5%), and hypertension (20.4%).

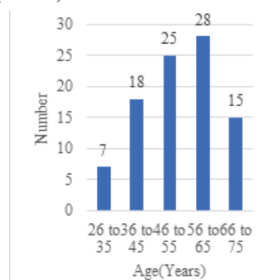
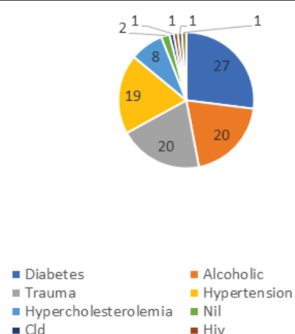


Fig 1. Age Distribution of Study Participants



**Fig 2. Comorbidities of Cohort**

#### LRINEC Score Distribution Pre- and Post-Operative:

Figure 3 demonstrates, on admission, 74.2% of patients had a LRINEC score  $\leq 5$ , 18.3% scored between 6 and 7, and 7.5% scored  $\geq 8$ . Post-debridement, 84.9% scored  $\leq 5$ , indicating a significant decrease in scores ( $p < 0.05$ ) following surgical intervention.<sup>[4]</sup>

#### Outcomes and Mortality Rate:

The overall mortality rate in this cohort was 20.4%. Referencing to table 3, patients who died had a higher mean preoperative LRINEC score (7.05) compared to survivors (3.32,  $p < 0.001$ ).<sup>[9]</sup>

**Table 3: Comparison of Variables with the Outcome**

| Variables                 | Group             |                  | P Value |
|---------------------------|-------------------|------------------|---------|
|                           | Survived          | Died             |         |
| Age                       | 50.99 $\pm$ 11.81 | 59.16 $\pm$ 7.61 | 0.001   |
| Lrinec preop              | 3.32 $\pm$ 1.27   | 7.05 $\pm$ 0.85  | 0.0001  |
| Lrinec post op            | 3.23 $\pm$ 1.26   | 6.89 $\pm$ 0.74  | 0.0001  |
| Time from admission (hrs) | 9.61 $\pm$ 9.22   | 10.74 $\pm$ 3.86 | 0.604   |

#### Diagnostic Accuracy of LRINEC Score:

With a cutoff value of 6.5, the LRINEC score demonstrated a specificity of 95%, sensitivity of 68%, PPV of 76%, and NPV of 92%, yielding an overall accuracy of 89%.<sup>[6]</sup>

#### DISCUSSION

The high mortality rate (20.4%) observed in this study reinforces the critical need for prompt identification of NF to initiate timely and aggressive treatment. The LRINEC score has shown strong prognostic value in predicting mortality, but limitations exist in its diagnostic sensitivity and in reliably identifying all high-risk patients.<sup>[1]</sup>

#### LRINEC Score as a Prognostic Tool

An initial LRINEC score above 7 was found to be an independent predictor of mortality, evidenced by a significantly higher mean score in patients who died (7.05 vs. 3.32,  $p < 0.001$ ) as shown in table 3, table 4.<sup>[3]</sup>

**Table 4: LRINEC Score to Predict Progression**

| Variables                 | Group             |                  | P Value |
|---------------------------|-------------------|------------------|---------|
|                           | Survived          | Died             |         |
| Age                       | 50.99 $\pm$ 11.81 | 59.16 $\pm$ 7.61 | 0.001   |
| Lrinec preop              | 3.32 $\pm$ 1.27   | 7.05 $\pm$ 0.85  | 0.0001  |
| Lrinec post op            | 3.23 $\pm$ 1.26   | 6.89 $\pm$ 0.74  | 0.0001  |
| Time from admission (hrs) | 9.61 $\pm$ 9.22   | 10.74 $\pm$ 3.86 | 0.604   |

The score's high specificity (95%) and accuracy (89%) at a 6.5-point cutoff further emphasize its utility for mortality risk stratification at admission. This aligns with Neeki et al.'s findings where a higher LRINEC score correlates with a higher likelihood of necrotizing fasciitis (NF) and worse outcomes.<sup>[1]</sup> However, the sensitivity (68%) suggests that clinical judgment and regular reassessment are vital alongside LRINEC scoring to capture high-risk patients comprehensively. El-Menyar et al. (2017), similarly, found that an initial high LRINEC score was significantly associated with mortality, but the sensitivity of the score was not always sufficient for early detection, supporting our study's conclusion that clinical judgment remains crucial.<sup>[3]</sup> However, the sensitivity (68%) suggests that clinical judgment and regular reassessment are vital alongside LRINEC scoring to capture high-risk patients comprehensively.

Important to note that in the present study, age can be said as an independent variable to predict mortality. Neither diabetes mellitus,

nor alcohol use disorder could be shown to influence the change in LRINEC score in this study which is in contrast to some previous studies. These factors can act as confounders and alter the outcome of the disease for the patient but are not taken into account by the LRINEC score. (See Table 4)

#### Impact of Debridement on LRINEC Score

The post-debridement reduction in LRINEC scores, with an average decrease of 1.54 points, aligns with the critical role of surgical intervention in improving patient outcomes, as depicted in Fig 4, the lower postoperative scores in survivors compared to non-survivors (mean: 3.23 vs. 6.89) further support timely and aggressive debridement in managing NF.<sup>[4]</sup>

Hoesl et al. (2022) similarly noted that debridement significantly reduces LRINEC scores and improves patient outcomes, aligning with our study's finding that early and aggressive debridement contributes to better survival rates. Regular LRINEC assessments post-debridement provide a dynamic view of patient recovery and may help guide further therapeutic decisions.

#### LRINEC Score in Clinical Practice

Although the LRINEC score has prognostic utility, only 24.9% of patients presented with initial scores  $\geq 6$ , suggesting limited diagnostic value for differentiating NF from other infections in early stages. BJSJ (2017) also observed that while the LRINEC score is useful in predicting outcomes, its diagnostic accuracy in early NF diagnosis is limited, similar to the findings in our study. Factors such as hemoglobin and CRP levels, affected by comorbidities and surgical intervention, can also complicate score interpretation in post-debridement settings. The LRINEC score should therefore complement rather than replace clinical evaluation and serial monitoring.<sup>[7]</sup>

#### Time to Debridement and Mortality

Contrary to expectations, this study did not find a statistically significant association between the timing of debridement and mortality outcomes ( $p = 0.604$ ) as shown in table 4. However, timely debridement remains a vital component of NF management to mitigate infection load and systemic involvement, as observed in the reduced LRINEC scores post-intervention.

Holland et al. (2009) similarly emphasized the importance of early surgical intervention, but noted that the timing of debridement did not consistently correlate with improved survival outcomes, suggesting that the severity of the infection and other factors may also play a significant role.<sup>[5]</sup>

#### LRINEC Score and Progression of Necrotising Fasciitis

To guide prognosis of the patient, the postoperative score was correlated with the outcome as shown in Table 5, but no statistical significance between the score at admission and postoperative score with outcome was found. Hoesl et al. (2022) also did not find a significant correlation between the postoperative LRINEC score and the patient's outcome, indicating that the progression of NF may involve other factors beyond what the LRINEC score measures, such as age and comorbidities.<sup>[4]</sup>

**Table 5: Pre and Post LRINEC with Outcome**

| Lrinec  | Group           |                 |
|---------|-----------------|-----------------|
|         | Survived        | Died            |
| Pre     | 3.32 $\pm$ 1.27 | 7.05 $\pm$ 0.85 |
| Post    | 3.23 $\pm$ 1.26 | 6.89 $\pm$ 0.74 |
| P Value | 0.146           | 0.482           |

#### CONCLUSION

This study validates the LRINEC score as a useful prognostic tool for NF mortality risk assessment, though its diagnostic limitations mean it should be employed in conjunction with clinical evaluation. The significant reduction in LRINEC scores post-debridement underscores the importance of early and aggressive surgical intervention. Given its high specificity and moderate sensitivity, the LRINEC score aids prognosis but should be combined with clinical parameters for a holistic approach to NF management.

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