

A Study on LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) as a Tool for Early Diagnosis & Management of Necrotizing Fasciitis

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Abstract: ***Aims and Objectives:** 1. To apply the LRINEC score as a tool for early diagnosis of necrotizing fasciitis among patients presenting with soft tissue infection. 2. For early surgical intervention and better outcome in patient presenting with necrotizing fasciitis. **Methods:** The present study was carried out in the Department of General Surgery, Kamineni Institute of Medical Sciences, Narketpally. The study includes 50 patients who were admitted during the period from October 2020-September 2021. **Results:** LRINEC score <6- low risk, 6-8 intermediate risk, >8 high risk. Incidence was highest in the age group ranging from 51- 60 years. M:F = 2.3:1. More common in lower limbs (66.4%) and scrotum (33.6%). All the patients presented with swelling, redness, pain and induration. Diabetes Mellitus was detected as a co-morbidity (52%). The score was able to identify the necessity of surgical management for 23(46%) of patients. • Conservative treatment was proposed to 48% of cases, 32% needed debridement, 16% needed fasciotomy and 4% underwent amputation. The culture & sensitivity showed more of poly-microbial organisms (52%) than mono microbial (32%) and skin commensals (16%). The mortality is seen in 3 cases (6%), due to multiple co-morbidities and the LRINEC score was >8. **Conclusion:** Necrotizing fasciitis is a rare and life threatening condition that requires immediate action, but uncertainties still hampers prompt diagnosis and treatment. LRINEC scoring system has a better positively predictive value in identifying the onset of necrotizing fasciitis and risk stratifying of the patients with severe soft tissue infection. At the end of my study the LRINEC scoring has been validated and found to have an accurate diagnostic tool in predicting the outcome of patients with soft tissue infections.*

Keywords: LRINEC score, Necrotising fasciitis

1.Introduction

Necrotizing fasciitis (NF) is a rapidly progressing, inflammatory infection of the fascia with the secondary involvement of skin, subcutaneous tissues and muscle, associated with substantial morbidity and mortality⁽¹⁻²⁾.

Necrotizing Fasciitis causes significant inflammation and destruction of skin, deep fascia and soft tissues, toxemia typically caused by Streptococcus pyogenes bacteria, but sometimes due to mixed infections such as anaerobes, coliforms, Gram-negative species⁽³⁾. It is a severe form of soft tissue infection and with no surgical treatment the mortality rate reaches up to 30-60 percent. Mortality is directly proportional to time to intervention. More than 90% of NF patients will also need intensive care and organ supportive therapy; that makes NF a medical emergency (4). High morbidity and mortality associated with NF makes it an emergency; early debridement will have a favorable outcome. Hence, it is a surgical emergency⁽⁵⁾.

Delay in surgical intervention has been shown to increase the mortality rate⁽³⁻⁹⁾. However, the lack of specific clinical features in the early stages of the disease may be the main reason for failure of early recognition of necrotizing soft tissue infection [NSTI]. The major prognostic

determinants like systemic complications, duration of hospital stay and mortality can be reduced by early recognition, aggressive debridement of necrotic tissues, early commencement of intravenous antibiotics⁽⁴⁾.

The Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) score was first proposed by Wong et al⁽⁹⁾ utilizing 6 laboratory variables that are routinely measured to assess soft tissue infections that enabled the categorization of patients into low-risk, intermediate-risk, and high-risk groups. A score of 6-7 meant 50%-75% risk of NF whereas any score more than 8 is a high indicator to more than 75% risk⁽⁹⁾.

With this background in mind that this study set forward to validate the effectiveness in patients presenting with soft tissue infection using LRINEC scoring system. It would be a boon to the developing countries like India, where the mortality of disease is high ranging from 7% to 76% and there is also a constraint on resources.

2.Aim

To study the role of usage of LRINEC score in early diagnosis and management of necrotizing fasciitis.

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3.Objectives

1. To apply the LRINEC score as a tool for early diagnosis of necrotizing fasciitis among patients presenting with soft tissue infection.
2. To study early surgical intervention for better outcome inpatient presenting with Necrotizing Fasciitis.

Patients and Methods:

The present study was carried out in the Department of General Surgery, Kamineni Institute of Medical Sciences, Narketpally. The study includes 50 patients who were admitted during the period from October 2020 - September 2021.

Inclusion Criteria:

- Patients of age 18-80years
- Patients presenting with symptoms and signs of soft tissue infections during the study period
- Both females and males

Exclusion Criteria:

- Age group below 18years.
- Patients who have received antibiotic treatment in the last 48 hours or a minimum of 3 doses of antibiotic prior to presentation.
- Patient who had undergone surgical debridement for present episode of soft tissue infection

4.Methods

The present study “A Study on Lrinec (Laboratory Risk Indicator For Necrotizing Fasciitis) as a Tool for Early Diagnosis & Management of Necrotizing Fasciitis” is a prospective study, carried in Department of General Surgery, Kamineni Institute of Medical Sciences, Narketpally, Nalgonda, during the period of October 2019 to September 2021.

Assessment of parameters:

All consenting patients with necrotizing fasciitis would be clinically examined after history taking and then subjected to blood investigations as follows:

- C-reactive protein
- Hemoglobin
- Glucose
- Creatinine
- Sodium
- Total white cell count

Methods of Collection of Data:

- Patients presenting with symptoms suggestive of soft tissue infections will undergo clinical examinations and the above mentioned investigations.

- Using a pre-tested semi-structured proform a cum quantitative checklist, which will collect information on characteristics & covariates of soft tissue infections.
- LRINEC scoring system will be applied to each of the study subjects.

LRINEC (laboratory risk indicator for necrotizing fasciitis) score

Laboratory parameter	LRINEC points
C-reactive protein (mg/l)	
< 150	0
≥ 150	4
Total white blood cell count (µ l)	
< 15	0
15-25	1
>25	2
Hemoglobin (g/dl)	
>13.6	0
11-13.5	1
< 10.9	2
Sodium (mmol/l)	
≥ 135	0
< 135	2
Creatinine (mg/dl)	
≤ 1.6	0
>1.6	2
Glucose (mg/dl)	
≤ 180	0
>180	1

Figure: LRINEC scoring scale

5.Observation and Results

Table 1: Distribution According LRINEC Risk Score (n=50)

LRINEC Score	Number of cases	Percentage (%)	Risk
<6	27	54	Low
6-8	20	40	Intermediate
>8	3	6	High
Total (n)	50	100	

Patients were categorized into different risk groups using the LRINEC score.

Patients having LRINEC score-< 6 were categorized as low risk,

6-8 as intermediate risk, and

> 8 as high risk

Table 2: Distribution of Cases According to Age Group (n=50)

Age of patients (years)	LRINEC Score Risk			Total (n) (%)
	Low (n-27)	Intermediate (n-20)	High (n-3)	
18-30	1	0	0	1 (2)
31-40	1	0	0	1 (2)
41-50	10	7	0	17 (34)
51-60	9	7	2	18 (36)
61-70	1	3	0	4 (8)
71-80	5	2	1	8 (16)

Table 3: Distribution of Cases According to Gender (n=50)

Gender	Male (%)	Female (%)
Low risk	18 (66.6)	9 (33.4)
Intermediate risk	14 (70)	6 (30)
High risk	3 (100)	0 (0)
Total (n)	35 (70)	15 (30)

Table 4: Anatomical Site Involved (n=50)

Site effected	LRINEC risk score			Total (n) (%)
	Low risk (%)	Intermediate risk (%)	High risk (%)	
Lower limb	23 (85.2)	16 (80)	2 (66.4)	41 (82)
Upper limb	2 (7.4)	1 (5)	0 (0)	3 (6)
Scrotum	2 (7.4)	3 (15)	1 (33.6)	6 (12)

Table 5: According to the Symptoms

Signs & Symptoms	No. of patients	Percentage (%)
Swelling	50	100
Redness	50	100
Pain	50	100
In duration	50	100
Blister	33	66
Skin necrosis	8	16

Table 6: According to Co-Morbidities

CO-morbidities	LRINEC Risk Score			Total (n) (%)	Chi square value	p value
	low risk (%)	Intermediate risk (%)	High risk (%)			
DM	15 (55.1)	8 (40)	3 (100)	26 (52)	7.81	0.25
HTN	3 (11.1)	3 (15)	3 (100)	8 (15)		
CKD	9 (30.3)	5 (25)	3 (100)	7 (14)		
PVD	1 (3.5)	4 (20)	0 (0)	5 (10)		

Table 7: According to the Treatment Given (n=50)

	Low risk	Intermediate	High	Total (n) (%)	square p-value value
	(%)	risk (%)	risk (%)		
Conservative	21 (77.7)	3 (15)	0 (0)	24 (48)	<0.001 74.12 (highly significant)
Debridement	6 (22.3)	10 (50)	0 (0)	16 (32)	
Fasciotomy	0 (0)	7 (35)	1 (33.3)	8 (16)	
Amputation	0 (0)	0 (0)	2 (66.7)	2 (4)	

Table 8: According to the Culture & Sensitivity (n=50)

Culture & sensitivity	Number of cases	Percentage (%)
Poly-microbial organisms	26	52
Mono-microbial organism	16	32
Skin commensals	8	16
Total (n)	50	100

Table 9: Mean Duration of Hospital stay

LRINEC Risk Score	Mean duration of hospital stay in days (mean ± SD)	p-value
Low Risk	9.88 ±7.09	<0.001 (highly significant)
Intermediate risk	19.85±8.42	
High risk	3.33 ±1.52	

Table 10: According to Outcome

Outcome	LRINEC Risk Score			Total (n) (%)	Chi square value	p value
	Low risk (%)	Intermediate risk (%)	High risk (%)			
Recovered	27 (100)	20 (100)	0 (0)	47 (94)	50	<0.001 (Highly significant)
Expired	0 (0)	0 (0)	3 (100)	3 (6)		

Study Subjects

Necrotizing Fasciitis of Lower Limb



Post Fasciotomy Status of Necrotizing Fasciitis



Post Fasciotomy Status of Necrotizing Fasciitis



Cellulitis of Right Lower Limb



Post Debridement Status with Ulcer on the Dorsum of Foot



Spilt Skin Grafting of Dorsum of Foot



Post Debridement Status of Necrotizing Fasciitis



Spilt Skin Grafting of Lower Limb



6. Discussion

- Total of 50 patients presenting with symptoms and signs of necrotizing fasciitis to hospital were recruited into the study based on the inclusion and exclusion criteria mentioned earlier.
- In the present study, patients were categorized using LRINEC score which is based on a fixed set of investigation parameters.
- Those having LRINEC score < 6 were categorized as low risk, between 6-8 as intermediate, and > 8 as high risk. (9)
- At the end of the studies the observations are compared with some of the studies in world statistics.

Comparison of Risk Groups

Risk	Bansal N. et. al (n=60)	Present study (n=50)
Low	43.3%	54%
Intermediate	40.0%	40%
High	16.7%	6%

7. Summary

The present study is “A Study on LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) as a Tool for Early Diagnosis & Management of Necrotizing Fasciitis”

done at Kamineni Institute of Medical Sciences, Narketpally, from October 2019 To October 2021.

- Fifty cases of soft tissue swelling which were admitted in Kamineni Institute of Medical Sciences were studied. The statistical data and analysis of the cases studied during this period are presented in this study.
- The cases are divided into low risk, intermediate risk and high risk according to the LRINEC score.
- LRINEC score <6-low risk, 6-8 intermediate risk, >8 high-risk.
- Incidence was highest in the age group ranging from 51-60years.
- It is more common in males than in females with a ratio of 2.3: 1.
- It is more common in lower limb (66.4%) and scrotum (33.6%).
- All the patients presented with swelling, redness, pain and in duration.
- In majority of cases DM was detected as a co-morbidity (52%).
- The score was able to identify the necessity of surgical management for 23 (46%) of the patients in the present study.
- According to their clinical condition conservative treatment was proposed to 48% of cases, 32% needed debridement, 16% needed fasciotomy and 4% underwent amputation.
- The culture & sensitivity shown more of poly-microbial organisms (52%) than mono-microbial (32%) and skin commensals (16%).
- The mean hospital stays for cases with score 6 and more is 19.85±8.42 days and that of high risk is 3.33±1.52 days due to mortality.
- The mortality is seen in 3 cases (6%), due to multiple co-morbidities and the LRINEC score was >8.
- The Mortality is nil in cases of the score <6.

8. Conclusion

- Necrotizing fasciitis is a rare and life threatening condition that requires immediate action; but uncertainties still hamper prompt diagnosis and treatment.
- The mainstay of treatment is immediate resuscitation of the patient, followed by aggressive surgical debridement, leading to a favorable outcome.
- Laboratory findings and other diagnostic tests may be useful adjuncts, but the diagnosis is still primarily a clinical one, and suspicion alone warrants early surgical referral.
- LRINEC scoring system is one such tool aimed at early diagnosis of necrotizing fasciitis, which in turn leads to early surgical intervention and better outcome.
- In this, WBC count, Hemoglobin, Sodium levels, C-reactive protein, serum creatinine, and blood glucose levels were taken into account.
- 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 infection. There is a statistically significant

association between diabetes mellitus and the severity of risk.

- At the end of my study the LRINEC scoring has been validated and found to have an accurate diagnostic tool in predicting the outcome of patients with soft tissue infections.

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Case Proforma

Name:

IPNO:

Age:

Gender:

D. O. A:

D. O. D:

Occupation:

Address:

Chief Complaints:

History of Present Illness:

Swelling: Duration

Mode of onset: sudden/insidious

Progress: gradual/rapid

Discoloration Blebs

Ulcer

Pain: present/absent

Discharge: Present/absent

Fever: present/absent

Continuous/remnant/intermittent

Past History:

History of similar complaints

History of surgery in the past History of related medical disorders

Personal History:

Appetite Sleep Bowel habits

Bladder

Habits Smoking Alcohol Betelnut chewing

Family History:

General Physical Examination:

Built Nourishment

Pallor/icterus/clubbing/cyanosis/kylonicchia/Lymphad enopathy/bilateral

pedaledema

Pain in passive movements

Oral hygiene

Pitting edema

Head and scalp

Peripheral pulses

ENT examination

Systemic Examination:

Vital Signs:

Cardiovascular system

Temp-Blood pressure-Pulse rate-Spo2-

Respiratory system

Local Examination:

Abdominal examination: organomegaly/free fluid/BS

Inspection

Central Nervous system

Swelling-Site

Clinical Diagnosis:

Extension

Investigations-

Discoloration

Routine Investigations:

Blebs

Investigation	Value	Score
C-reactive protein		
Total count		
Hemoglobin (gm/dl)		
Sodium (mmol/l)		
Creatinine (mg/dl)		
Glucose (mg/dl)		
	TOTAL SCORE	

Ulcer

Discharge-present/absent

Palpation

Tenderness

LRINEC Score: Treatment: Follow Up:

Local rise of temperature

Master Chart

Sl. No	IP number	Age	Gender	Co-morbidities				WBC	HB	CR	Na+	RBS	CRP	LRINEC score	Management	Outcome
				DM	HTN	CKD	PVD									
1	202044326	55	F	Y	N	N	N	17000	14	0.9	140	170	165	5	Debridement	Recovered
2	202045013	38	M	N	N	Y	N	14000	13	1.9	139	160	120	4	Conservative	Recovered
3	202045820	70	M	N	Y	N	N	25000	14	1	126	120	160	7	Conservative	Recovered
4	202040248	50	M	N	N	N	Y	20000	8	0.8	141	182	168	8	Fasciotomy	Recovered
5	202045195	60	M	Y	N	N	N	15000	10	0.8	130	190	117	4	Conservative	Recovered
6	202046452	42	F	N	N	Y	N	22000	14	0.8	120	170	120	3	Conservative	Recovered
7	202046814	45	M	Y	Y	N	N	20000	11	0.9	135	170	190	8	Debridement	Recovered
8	202039843	30	M	Y	N	N	N	15000	12	0.9	125	170	140	4	Conservative	Recovered
9	202039428	50	M	N	N	Y	N	17000	13	1.8	140	190	140	5	Conservative	Recovered
10	202039446	60	F	Y	N	N	N	29000	11	1.6	135	140	170	6	Debridement	Recovered
11	202039460	41	M	N	N	Y	N	17000	12	2.2	124	150	140	7	Debridement	Recovered
12	202050472	55	F	N	N	N	N	29000	11	0.8	140	170	170	7	Debridement	Recovered
13	202050562	44	M	Y	Y	N	N	13000	14	1.2	129	190	135	3	Conservative	Recovered
14	202004106	60	M	N	N	N	Y	25100	15	1.5	131	160	162	8	Fasciotomy	Recovered
15	202004135	70	M	N	N	Y	N	11000	14	1.2	130	120	130	2	Conservative	Recovered

16	202005969	41	M	Y	N	N	N	17200	12	2.5	135	172	96	7	Debridement	Recovered
17	202009557	45	M	N	N	Y	N	22300	12	0.9	139	105	96	2	Conservative	Recovered
18	202014055	55	M	Y	Y	y	N	12400	9.6	3	127	154	384	10	Amputation	Expired
19	202015512	61	F	Y	N	N	N	11800	14	0.7	136	112	192	4	Conservative	Recovered
20	202016528	46	M	N	N	Y	N	12900	13	0.7	139	111	192	5	Debridement	Recovered
21	202016538	48	M	Y	N	N	N	15500	16	2.3	136	81	48	3	Conservative	Recovered
22	202017804	44	M	N	N	Y	N	20900	12	1.1	130	94	155	8	Fasciotomy	Recovered
23	202019343	45	M	Y	N	N	N	10400	5.7	0.9	133	184	135	5	Debridement	Recovered
24	202026642	70	M	N	N	Y	N	27000	15	1	129	190	148	5	Conservative	Recovered
25	202021460	60	M	Y	N	N	N	8000	13	0.7	134	90	184	7	Debridement	Recovered
26	202022879	50	F	N	Y	N	N	18000	10	1.3	140	142	170	7	Conservative	Recovered
27	202023926	45	F	Y	N	N	N	7100	8.7	0.6	132	192	140	3	Conservative	Recovered
28	202024504	69	M	N	N	N	Y	15700	12	0.8	130	112	160	8	Fasciotomy	Recovered
29	202102186	55	M	Y	N	N	N	7900	14	2.6	126	116	384	8	Debridement	Recovered
30	202106738	59	M	N	Y	N	N	8900	9	0.9	133	94	92	4	Conservative	Recovered
31	202106993	57	F	Y	N	N	N	7300	10	1.9	134	186	140	7	Debridement	Recovered
32	202109066	72	F	Y	N	N	N	13800	15	0.8	125	228	140	3	Conservative	Recovered
33	202109572	74	M	Y	Y	y	N	27600	9	0.6	136	200	160	9	Debridement	Expired
34	202112587	70	M	N	N	N	Y	18000	8.5	3.5	134	292	94	8	Fasciotomy	Recovered
35	202112874	55	F	Y	N	N	N	700	6.4	1.5	129	100	32	4	Conservative	Recovered
36	202113349	65	F	N	N	Y	N	25000	9.7	3.4	131	62	50	7	Debridement	Recovered
37	202113564	44	M	Y	N	N	N	27500	15	0.5	133	115	192	8	Conservative	Recovered
38	202114001	60	M	Y	N	N	N	8100	8.7	0.8	126	120	117	4	Debridement	Recovered
39	202114438	55	M	N	N	Y	N	28000	7.7	1	135	160	172	7	Debridement	Recovered
40	202114701	48	M	Y	N	N	N	12300	15	2.6	128	130	94	4	Conservative	Recovered
41	202114920	60	M	N	Y	N	N	13000	12	1.2	132	192	120	4	Debridement	Recovered
42	202115277	80	M	Y	N	N	N	26500	12	0.9	140	183	386	8	Fasciotomy	Recovered
43	202116220	57	F	Y	N	N	N	19400	13	1.4	134	99	120	4	Conservative	Recovered
44	202115587	43	F	N	N	Y	N	14800	15	2.2	135	194	130	3	Conservative	Recovered
45	202115861	60	F	Y	N	N	N	15500	10	1	134	190	130	5	Conservative	Recovered
46	202125329	58	M	Y	y	y	N	26500	13	0.7	134	77	192	9	Amputation	Expired
47	202123724	75	M	N	N	Y	N	7000	11	1	130	82	100	3	Conservative	Recovered
48	202124495	60	M	N	N	N	Y	9800	12	1.2	131	96	142	4	Debridement	Recovered
49	202125337	78	M	Y	N	N	N	17800	14	0.9	136	184	140	3	Conservative	Recovered
50	202123732	68	F	N	N	Y	N	22000	6.8	1	137	101	153	7	Debridement	Recovered