Orginal Article

Evaluation of Etiopathogenesis, Clinical Profile and Lrinec Scoring in Necrotising Soft Tissue Infections

Sahil Mittal[1], Rishab Yadav[2], Kapil Sindhu[3], Parth Patel[1], Pragya Bhagwati[1], Shiva Patel[1]

[1]Junior Resident, Dept. of surgery, [2]Junior Resident, Dept. of Radiology, Dept. of Surgery, [3]Assistant Professor, Dept. of Surgery, MMIMSR, Mullana Ambala

Abstract

Necrotising soft-tissue infections can be defined as infections of any of the layers within the soft tissue compartment that are associated with necrotising changes. NSTI is an uncommon but life-threatening. To resolve this, some authors have developed different diagnostic adjuncts such as finger tests, skin biopsies, bedside ultrasounds and laboratory parameters in distinguishing NSTI from other soft-tissue infections (LRINEC laboratory risk indicator for necrotizing fasciitis score). **Material and Method** : An observational study was conducted in 50 patients (clinically diagnosed necrotising soft tissue infection). clinical observations supported by relevant investigations were documented on the attached proforma and the data so obtained was statistically analysed. **Observation and result** : The results suggested that maximum number of affected individuals are males, middle aged individuals. Majority of patients had normal pulse with mean body temperature of 37.3°C, normal blood pressure,INR, normal serum level of sodium, potassium and bilirubin. High level of RBS (more than 200mg/dl). Tenderness was the most commonly elicited clinical sign of NSTI, crepitus was noted in only 20% patients. Maximum number of patients were found to be infected by streptococcus pyogenes (42%). The mean level was -hemoglobin -10.2+2.3 g/dl, WBC -13,340 + 6116 /mm3, serum creatinine value of s 1.6mg/l. High discrepancy noted in value of CRP. High prevalence of NSTI involving the extremities ranging from 64.39% to 93.The mean value of LRINEC score is 6±2.92 36 % of patients having <6 score and 64% patients having score >6. **Conclusion** : It can be concluded that the local clinical findings are of paramount importance rather than clinical features of systemic toxicity such as fever and tachycardia.

Keywords: *Clinical Profile, Evaluation, LRINEC score,*

Introduction

Necrotizing soft-tissue infections (STIS) can be defined as infections of any of the layers within the soft tissue compartment (dermis subcutaneous tissue, superficial fascia, deep fascia, or muscle) that are associated with necrotizing changes. They are usually caused by the synergistic presence of various aerobic or anaerobic, gas producing or not, bacteria. Their progression is often fulminant and it has been recognised for centuries. NSTI may appear in any anatomical region, multiple layers may be involved at times and, despite the portal of entry being a rupture in the skin continuity, sometimes this cannot be found ([1]) .

The abdomen, perineum and lower limbs are the most common sites of such infections. Practically NSTI may develop after any kind of operation, but more often occurs after incarcerated inguinal hernias, perianal abscesses, urological operations and gynaecological operations [(2,3)] NSTI has been reported after blunt or penetrating trauma, postoperative complications, injection of intravenous drugs or subcutaneous insulin, animal bites, colocutaneous fistula, renal calculi, and idiopathic causes [(4,5)] . A portal of entry as obvious as a tissue injury (iatrogenic or not) or a bite (animal or human) is required for the development of a NSTI. However, these infections may occur without such obvious portal of entry [(6)] . Once susceptible patients are colonised, the causative bacteria produce toxic proteolytic enzymes that allow for tissue invasion [(7)] . Anaerobic environment and vascular thrombosis in the affected area accelerate bacteria proliferation and, through hematogenous spread, a distant infection may occur [(8)].

Predisposing factors of NSTI include advanced age, diabetes mellitus, malnutrition or obesity, drug abuse, corticosteroid use, immunosuppression, AIDS, chronic obstructive lung disease (COPD) together with the chronic use of steroids, serious trauma, and chronic venous or lymph insufficiency with tissue oedema [9,10] . The presence of a foreign body in combination with/or dead tissue formation, urgent and extensive abdominal or perineal operations, as well as tissue ischemia (most often due to tight sutures, haematomas, peripheral angiopathy, irradiation and wide bums), are considered to be local predisposing factors [11, 12].

It is an uncommon but life-threatening disease with a high mortality rate (ranging from 6 to 76%) despite advances in modern medical care [1-3]. Delays in diagnosis and in operations for debridement are associated with increased mortality [1, 6]. Lack of specific clinical features and characteristics in the initial stages of the disease may be the main reason for the failure of early recognition of NSTI [8] . The purpose of this study was to develop a detailed clinical profile of necrotising soft tissue infections as an aid to diagnosis and management.

Material and Method

The study was conducted in the department of General Surgery,Maharishi Markandeshwar Institute Of Medical Sciences And Research (MMIMSR) Mulana, Ambala which is a tertiary care institute situated in Haryana, a northern state of India. All the patients of NSTIs admitted under department of general surgery were included in the study with effect from 1st October 2017- 30 September 2019.

A minimum of 50 patients formed subjects of the study.

Inclusion Criteria :

Patients presenting with infections of any of the layers of soft tissue compartment which includes dermis, subcutaneous tissue, superficial fascia, deep fascia or muscle which are accompanied by necrotising changes.

Exclusion Criteria :

1. Patient not giving their consent.
2. Patients lost in follow-up.
3. Patients not found to have NSTI's.

Study Tools

Following study tools were used for present study :

1. Clinical assessment and observation along with signs and symptoms of patients.

2. Laboratory investigations including The LRINEC score.

Study Protocol

All the patients included in the study were subjected to the following investigations-

Hematological investigations

- completehemogram.
- Fasting blood sugar
- Random blood sugar
- Serum sodium
- Serum potassium
- Serum creatinine
- Blood urea
- Liver function test including serum bilirubin (total and direct) alkaline phosphatase, aspartate transaminase, alanine transaminase and serum albumin.
- Coagulation profile which includes bleeding time, clotting time and PT/INR.
- C-reactive protein.

Radiological investigation wherever needed which includes:

Plain X Ray of the part

Computed tomography (CT scan)

Magnetic Resonance Imaging (MRI)

Histopathological confirmation of diagnosis was done from the biopsy of the involved tissue procured at the time of surgery. Tissue culture and antibiogram were done to identify pathogens and sensitivity.

Observation and Results

Mean age of the study population was 48.1± 17.7 years. Majority of patients were seen to be between 40 to 70 years of age. Tachycardia was reported in overall 28% of patients. Only 10 (20%) of patients NSTI, were

found to be febrile. Hypotension was seen in 6 (12%) of patients of NSTI, with blood pressure <90/60 mm of Hg. Majority of the patients in the present study had normal blood pressure. Tenderness was the most commonly reported clinical presentation of NSTI, with 45 (90%) of patients having tenderness of the involved region. Other commonly reported manifestations included skin discoloration (80) %, edema of overlying skin (68%), swelling (66%), warmth (66%) and exudative discharge (60%). Bleeding was the least common (2%) clinical presentation of NSTI in our study population. 46 patients had low hemoglobin levels of ≤13.5g/dl with 10 (20%) of them having sever anemia, with Hb< 8g/dl. The entire study population had a mean Hb of 10.2±2.3 gm/dl. Very high WBC counts of more than 25000 / cu mm were seen in 4 (8%) of the subjects with mean of 13,340±6116/ cumm. Mean RBS value for the entire study population was 180±117 gm/dl. 15 (30%) of patients had serum creatinine of more than 1.6mg/ dl with a mean of 1.40±0.72 mg/l. In this study there are 36% of cases having the LRINEC score ≤ 5. While 26% cases having score 6-7, only 38% have score 8 or above, suggesting that 36% of cases are expected to have <50% expectancy of having NSTI, while 26% cases are expected to have NSTI to about 50-75% and 38% cases have chance of having NSTI by 75% and above having mean value 6±2.92

Table1:Distribution of patients based on local examination

Clinical presentation	Number of patients (n=50)	Percentage
Skin discolouration	40	80%
Swelling	33	66%
Warmth	33	66%
Tenderness	45	90%
Edema ofoverlyingskin	34	68%
Crepitus	10	20%
Dermalgangrene/necrosis	25	50%
Exudate	30	60%
Foul Odour	15	30%
Bleeding	1	2%
Ulceration	25	50%

Table2: Distribution of cases based on their Hb levels

Haemoglobin(g/dl)	Number of patients (n=50)	Percentage
>13.5	4	8%
11 to 13.5	19	38%
8to10.9	17	34%
<8	10	20%

Table3: Distribution of patients based on white blood cell count

W.B.C range (percumm)	Number of patients (n=50)	Percentage
<15000	33	66
15000-25000	13	26
>25000	4	8

Table 4: Case distribution based on serum creatinine

Serum Creatinine	Number of patients (n=50)	Percentage
≤1.6	35	70
≥1.6	15	30

Table5: Percentage distribution of cases based on C Reactive Protein

CRPRange (mg/L)	Number of patients (n=50)	Percentage
≤150	18	36%
≥150	32	64%

Table 6: Percentage distribution of patients based on LRINEC score

LRINEC Score	Number of patients (n=50)	Percentage
≤5	18	36%
6-7	13	26%
≥8	19	38%

Discussion

Taking into account all the values, LRINEC scoring was done.The mean value of LRINEC score is 6±2.92 in our study. Similar findings are seen in the study by D. J. Tilkom et al (88) in which 25 out 30 patients (83.3%) had a LRINEC score > 6. Only in 5 patients (16,7%), the LRINEC score was <6, also it showed the LRINEC mean value of 7.3 against the values in our study showing 12 (27 %) in < 6 score and 32 (73 %) patients.

Similarly in a study done by Chin-Ho Wong et al (71), using the LRINEC score, he stratified the patients into three groups, low (LRINEC score <5), moderate (LRINEC score 6-7), or high (LRINEC score >8) risk categories for NSTI. These risk groups corresponded to a probability developing NSTI of <50%, 50-75%, and >75%, respectively. 89.99% of patients with NSTI had a LRINEC score of > 6 whereas only 10.1% had a score score of <6, comparative to our study having 36 % of patients having <6 score and 64% patients having score > 6. The mean value of our study Was6 ± 2.92, comparable to Wong's value of 7. This finding shows the LRINEC score is capable of detecting early cases of NSTI among patients with severe soft tissue infections. A LRINEC score of >6 should raise the suspicion of NSTI, and a score of is strongly predictive of this disease. The LRINEC score can significantly decrease the time to b diagnosis by stratifying patients into risk categories for NSTI warranting immediate further evaluation. Clinical variables alone are often nonspecific early in the course of the disease and can potentially lead to fatal delay operative treatment. A diagnostic score that includes clinical as well as laboratory variables would inevitably favour advance cases of NSTI where clinical recognition is usually not a problem) and risk missing early cases of NSTI (where early diagnosis would profoundly affect outcome). An objective diagnostic tool based on laboratory variables alone to assess for the possibility of NSTI is therefore advocated.

Conclusion

For the diagnosis of NSTI the local clinical findings viztenderness, skin discolouration are of paramount importance rather than clinical features of systemic toxicity such as fever and tachycardia.

Simple laboratory evaluation using the LRINEC scoring system is useful for diagnosing NSTI. A higher score (>6) is highly predictive of presence of NSTI, however a lower score (<5) does not altogether rule out the possibility of NSTI.

The microbiology of NSTI reveals majority of infections being mono microbial and caused by skin based organisms (staphylococci and streptococci). Therefore tissue culture and gram positive coverage are vital for NSTI patients.

Competing Interests: The authors declare that there is no conflict of interest in this study.

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Ethics Committee: Ethical clearance taken from institutional ethical committee.

References

1. Sutherland ME, Meyer AA. Necrotizing soft-tissue infections. SurgClin North Am. 1994; 74: 591-607
2. Fournier JEAN. Gangrènefoudroyante de la verge. Semin Med 1883; 3:345-7
3. Meleney FL. Hemolytic streptococcus gangrene. Arch Surg. 19249:317-64
4. Wilson B. Necrotizing fasciitis. Am Surg, 1952; 18:416-31
5. Baskin LS, Carroll PR, Cattolica EV, McAninch JW. Necrotizing soft tissue infections of the perineum and genitalia: bacteriology, treatment, and risk assessment. Br J Urol. 1990; 65: 524-9
6. Nichols RL, Florman S. Clinical presentation of soft-tissue infections and surgical site infections. Clin Infect Dis. 2001: 33 (Suppl. 2): S84-S93.
7. Ward RG, Walsh MS. Necrotizing fasciitis: 10 years' experience in a district general hospital. Br J Surg. 1991; 78:488-9
8. McHenry CR, Piotrowski JJ. Petrinic D, Malangoni MA. Determinants of mortality for necrotizing soft-tissue infections. Ann Surg. 1995; 221: 558-65
9. Francis KR, Lamaute HR, Davis JM, Pizzi WF. Implications of risk factors in necrotizing fasciitis. Ann Surg. 1993; 59: 3048
10. Marangoni Necrotizing soft tissue infections: are we making any progress? Surg Infect. 2001; 2: 145-52.
11. Bertram P ,Treutner KH, Stumpf M, Schumpelick V . Postoperative necrotizing soft-tissue infections of the abdominal wall.Langenbecks Arch Surg. 2000; 385: 3941
12. Voros D. Anaerobic infections of the soft tissue and bones. Anaerobe. 1997; 3: 11
13. Retroperitoneal necrotizingfasciitis. BrJSurg. 1992; 79: 342-4.
14. LewisRT. Soft tissue infections. World J Surg. 1998; 22:146-51.
15. BosshardtTL,HendersonVJ,OrganCHJr. Necrotizingsofttissueinfections.Arch Surg. 1996; 131: 846-52
16. ArslanA,PierreJerome,BorthneA. Necrotizingfasciitis:reliableMRI for disease in the preoperative diagnosis. EurRadiol. 2000;36:139-43
17. YamaokaM,FurusawaK,UematsuT,YasudaK .Early evaluation of necrotizing fasciitis with use of CT.J. Cranio Maxillo Fac Surg. 1994;22:268-71.
18. Theis JC,RietveldJ.Danesh-CloughT.Severe necrotizings of tissue infections in orthopaedic surgery. J Orthop Surg. 2002; 10:108-13.
19. VaidN,KothadiyaA,PatkiS,KanhereH.Necrotising fasciitis the neck .Indian Journal of Otolaryngology and Head and Neck Surgery.2002;54(2):143-5.
20. Wilkinson D ,Doolette D .Hyperbaric Oxygen Treatment and survival From Necrotizing Soft Tissue Infection. ArchSurg. 2004 139