

Original Research Article

A clinical study of lower limb cellulitis

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ABSTRACT

Background: Cellulitis is a soft tissue infection emerging as a major health issue in India. The aim of this study was to understand the incidence and associated causative factors of lower limb cellulitis.

Methods: This study was carried out at Department of General Surgery. This was a prospective, and NRI Institute of Medical Sciences, observational, clinical study included 100 patients who were admitted to the Visakhapatnam, with lower limb cellulitis. Period of study was between November 2017 to February 2022.

Results: The average age of incidence in the present study was 54.6 years and major risk factor is trauma. Among them 44% had open wound and of them only 34% of patients had growth for bacteria. Of 100 patients, 15% progressed to necrotizing fasciitis. The rate of mortality was 3% which was attributed to elderly age, renal failure and sepsis.

Conclusions: Hospital stay in cellulitis harness the years of healthy life leading to a reduction in income, aggravation of poverty levels and reduction in socioeconomic development of an individual. Proper understanding of the risk factors and factors associated with the complications of lower limb cellulitis will help healthcare professionals in implementing preventive strategies and consequently curb both the financial and health burden associated with the disease.

Keywords: Cellulitis, Necrotizing fasciitis, Renal failure, Sepsis

INTRODUCTION

Cellulitis is an infection of skin and soft tissue most often caused by *Streptococcus pyogenes* and *Staphylococcus aureus*, followed by non-group A beta hemolytic streptococci and gram-negative bacilli. It presents as an acute inflammatory response with endothelial leakage with interstitial edema and polymorphonuclear leucocyte infiltration.¹

The development of cellulitis can be simplified as three steps-bacterial adherence to host cells, invasion of tissue with evasion of host defenses and elaboration of toxins.² Acute bacterial cellulitis is potentially serious infection that usually recurs and could be on any parts of the body with majority (70-90%) being on lower limbs. Severity of

the infection may be mild, moderate and severe depending upon predisposing factors. Entry of etiologic agents are mostly by leg ulcers, traumatic injury and dermatophytic toe web intertrigo.³

Lower limb cellulitis more often requires emergency admission and hospitalization especially of the patients with comorbidities and elderly patients. Though the lower limb infection is rarely fatal and shows better recovery with timely and precise treatment with antibiotics, delay in treatment could lead to life threatening complications such as necrotizing fasciitis, septic shock and even death in extreme cases.⁴⁻⁶ Treatment of these infections has also become more difficult in the last decade due to the emergence and rapid spread of antibiotic resistant microorganisms.

Since there is no proper study that provides the incidence of cellulitis in southern India, the present study aimed at determining the incidence of cellulitis of lower limbs, demographic and clinical risk factors, clinical course and complications of the patients which helps healthcare professionals in better understanding of the condition and plan preventive treatment.

METHODS

The present prospective, observational, clinical study included 100 patients who were admitted to the department of general surgery, NRI Institute of Medical Sciences, Sangivalasa, Visakhapatnam, with lower limb cellulitis either unilateral or bilateral.

Period of study was between November 2017 to February 2022. We had used graph pad software for calculation of results. The study was approved by institutional ethics committee and informed consent was obtained from all the recruited patients.

Inclusion criteria

Patients admitted to department of general surgery with cellulitis of lower limbs, either unilateral or bilateral irrespective of etiology were included in the study.

Exclusion criteria

Patients who were not willing for admission and patients who received treatment on an outpatient department (OPD) basis; patients with cellulitis in other areas of the body other than lower limbs; patients suffering from Hansen's disease; patients who presented with necrotizing fasciitis or deep seated infections, with ulcers over the lower limbs; and children/young adults less than 18 years of age were excluded.

Data collection

Details of demographic data, underlying diseases, clinical features, microbiological data, antibiotic treatment, and medical outcomes were taken in a structured questionnaire and by thorough physical examination.

The patients who were recruited were first managed with the conservative treatment, and when there was no response to conservative management, patients were treated with surgery in the form of subcutaneous release incisions. Fasciotomy with debridement was done for patients who progressed to necrotizing fasciitis.

Indications for surgery, pre-operative work up, operative details, findings, procedure done and post-operative progress were noted. Patients were monitored through the entire period of stay in the hospital and complications, if any, were treated appropriately. After discharge, follow up of the patients was done till full resolution of cellulitis.

RESULTS

One hundred patients with cellulitis consisting 57 males and 43 females were included in the study. The age of the patients was between 21 years to 90 years and the average age of incidence was 54.61 years. The incidence of cellulitis is high among males (57%) than to females (43%). Unilateral limb is involved in 94% of the patients while bilateral involvement is seen in 6% of patients.

Table 1: Demographic data of patients.

Demographics	N
Sex	
Male	57
Female	43
Total	100
Bacteriology	
No growth	28
Growth	16
Pus sent for culture	44
Risk factors	
Trauma	50
Toe web infection	36
Venous insufficiency	7
Diabetes	6
Chronic lymphoedema	1
Total	100
Groups of management	
Conservative	50
Surgical	50
Total	100
Final outcomes in two groups of management	
Good	92 (50 conservative 42 surgical)
Poor-skin grafting	5
Expired	3
Total	100

Figure 1 shows the risk factors associated with lower limb cellulitis. Trauma is the most important risk factor followed by toe web space infection.

Table 2 displays the bacteriology of the patients. A total of 44 cases were suspected to have bacterial growth and sent for microbial examination. Only 16 cases were found to have positive growth to different forms of bacteria and remaining 28 cases were negative. Among the recruited 100 patients, 50% were given conservative treatment and other 50% were underwent surgical intervention to resolve cellulitis. Also 37 cellulitis patients were diabetic in which 15 patients were recovered with conservative treatment and the rest 22 patients had surgical interventions.

Figure 2 shows that out of the 12 patients with renal failures, the disease progressed to necrotizing fasciitis in 7 patients and no progression in 5 patients.

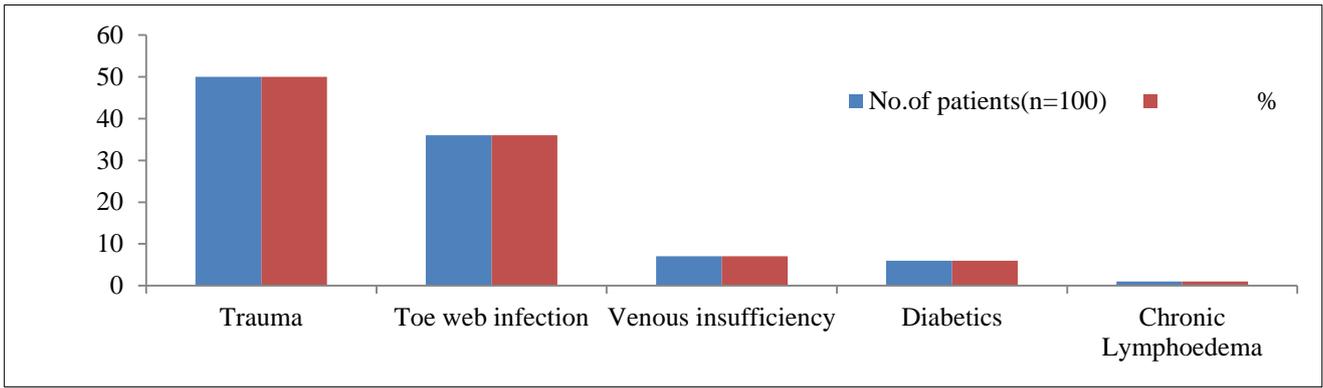


Figure 1: Risk factors for lower limb cellulitis.

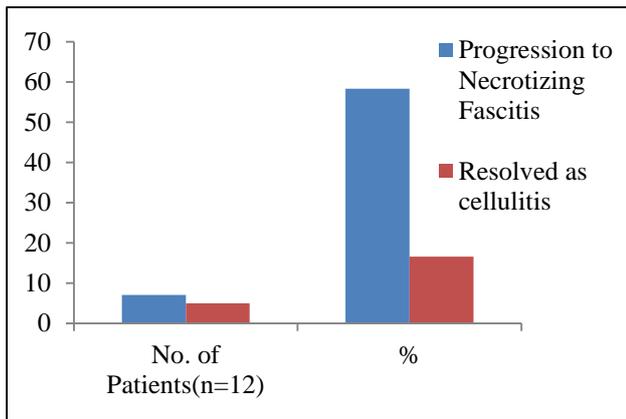


Figure 2: Clinical association.

Table 2 displays the bacteriology of the patients. A total of 44 cases were suspected to have bacterial growth and sent for microbial examination. Only 16 cases were found to have positive growth to different forms of bacteria and remaining 28 cases were negative.

Among the recruited 100 patients, 50% were given conservative treatment and other 50% were underwent surgical intervention to resolve cellulitis. Also 37 cellulitis patients were diabetic in which 15 patients were recovered with conservative treatment and the rest 22 patients had surgical interventions.

Figure 3 shows that 61 patients required less than a week of hospital stay, 26 patients required between 1 and 2 weeks, 7 patients required between 2 to 3 weeks and 3 patients required between 3 to 4 weeks. 3 patients expired during hospital stay.

Table 2: Bacteriology.

Pus culture	Number of patients	%
Pus sent for culture	44	44
No growth	28	63.6
Growth	16	36.4
Citrobacter	1	2.3
Coag -ve staph	3	6.8
Coag +ve staph	4	9.1
<i>E. coli</i>	2	4.5
<i>Klebsiella</i>	4	9.1
<i>Pseudomonas</i>	2	4.5

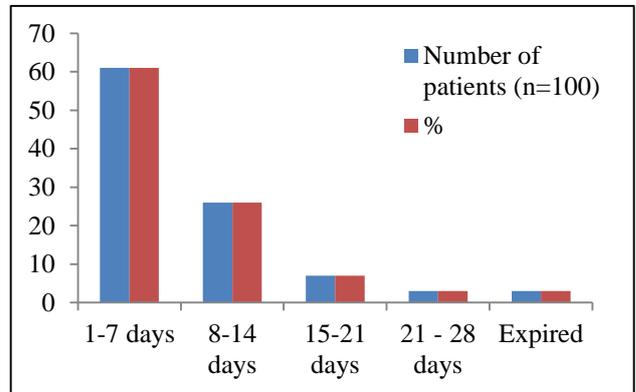


Figure 3: Duration of hospital stay in days.

Figure 4 depicts patients who had trauma and diabetes as the risk factors mainly needed surgical intervention and majority of the patients with toe web infection, venous insufficiency and chronic lymphoedema needed conservative management.

Table 3: Comparison of risk factors in two groups of management.

Risk factors	Conservative (n=50) %	Surgical (n=50) %	P value
Trauma	16 (32)	34 (68)	0.001**
Toe web infection	27 (54)	9 (18)	<0.001***
Venous insufficiency	1 (2)	5 (10)	0.204
Diabetics	5 (10)	2 (4)	0.436
Chronic lymphoedema	1 (2)	0	1

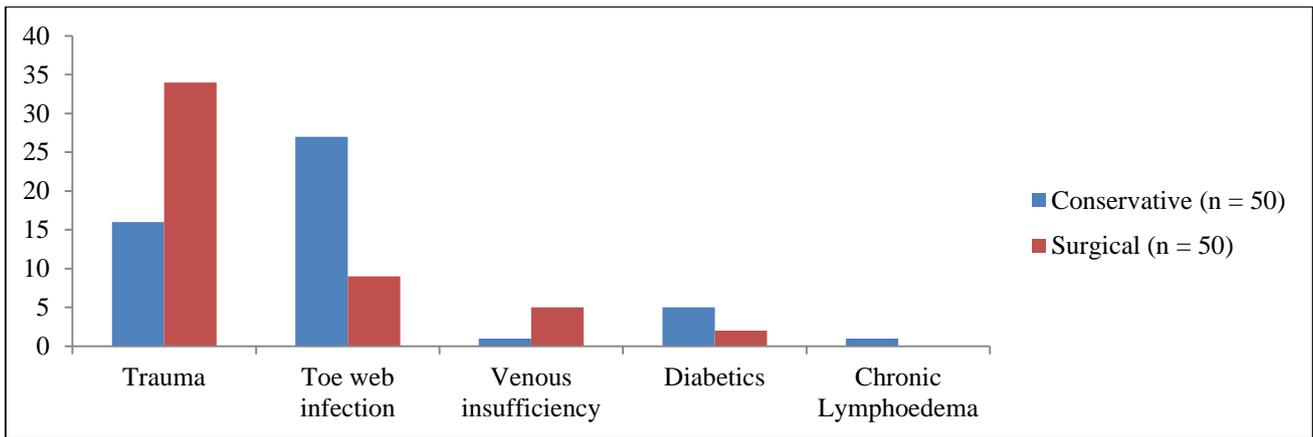


Figure 4: Comparison of risk factors in two groups of management.

Table 4 confers patients with conservative treatment received 3-10 days of hospital stay when compared to patients with surgical intervention who received 3-28 days of hospital stay.

Table 4: Comparison of hospital stay in two groups of management.

Duration of hospital stay (days)	Conservative (n=50)	Surgical (n=50)
Min-max	3-10	3-28 days
Mean±SD	4.72±1.84	10.26±5.86

Inference: hospital stay in days is significantly less in conservative compared to surgical (4.72 days versus 10.26 days with $p < 0.001^{**}$)

Figure 5 shows the final outcome of the conservative treatment patients was good whereas among 50 patients of surgical intervention, 42 patients had good outcome, 5 underwent skin grafting at a later date and 3 patients expired.

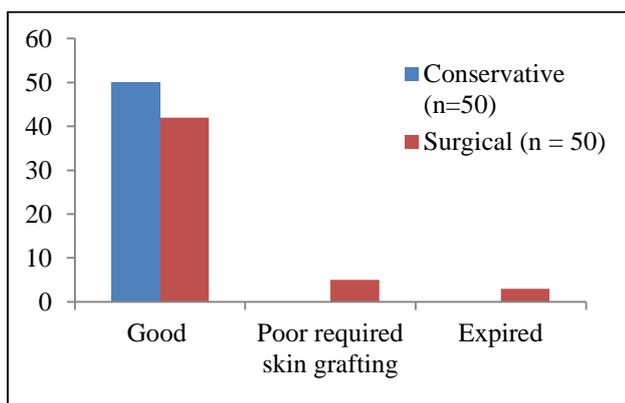


Figure 5: Comparison of final outcome in two groups of management.

DISCUSSION

Cellulitis is a common infection seen in the hospital as emergency visit or in surgical wards. The average age of

incidence in the present study is 54.6 years and. Namara et al conducted a study on 176 patients and found that the incidence is significantly higher with age and highest incidence is observed in patients with above 80 years of age.⁷ This might be due to the trauma as cause of cellulitis in the present study.

In a study of Dupuy et al 167 lower limbs cellulitis patients were studied of which 52% were males and 48% were females and showed the risk factors as disruption of the cutaneous barrier, venous insufficiency, obesity and trauma which was similar to the present study with 57% males and 43% females with the risk factors mentioned earlier and also no significance of the side involvement and diabetes was found for lower limbs.⁸

A total of 44 cases were suspected to have bacterial growth and sent for microbial examination. Organisms isolated in the positive growths are *Klebsiella*, coagulase positive *Staphylococci*, coagulase negative *Staphylococci*, *Pseudomonas*, *E. coli* and *Citrobacter*. Only 16 cases were found to have positive growth to different forms of bacteria and remaining 28 cases were negative. A study was conducted by Carratala et al including 332 adult cellulitis hospitalized patients and found 39% cases with *S. aureus* and *S. pyogenes* pathogens.⁹

The present study observed relatively lesser days of hospital stay in conservative treatment of cellulitis than surgical interventions which resembled the Halpen case control study of 150 patients where the mean duration of hospital stay was 10 days.¹⁰

The major complication noticed in the present study was cellulitis progressing to necrotizing fasciitis. Out of 100 patients, 15% were progressed to necrotizing fasciitis and remaining 85% is confined to subcutaneous tissue without fascial involvement. The rate of mortality was 3% and was attributed to elderly age, renal failure and sepsis.

This study doesn't infer regarding cellulitis in other parts of the body, cellulitis in young adults less than 18 years of age, cellulitis in patients of Hansen's disease, patients

treated in an outpatient basis. These were the limitations of this study.

CONCLUSION

Hospital stays in cellulitis harness the years of healthy life leading to a reduction in income, aggravation of poverty levels and reduction in socioeconomic development of an individual. Proper understanding of the risk factors and factors associated with the complications of lower limb cellulitis will help healthcare professionals in implementing preventive strategies and consequently curb both the financial and health burden associated with the disease.

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Conflict of interest: None declared

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

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