

## Original Research Article

# A retrospective study of 50 cases of lower limb soft tissue infection and its different modalities of presentation and its management

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### ABSTRACT

**Background:** Soft tissue infections are common in everyday practice. They show great variations in their severity. Skin and soft tissue infections are usually preceded by minor traumatic events. Among them soft tissue bacterial infections of lower limbs are more common. Patients having diabetes makes the scenario even worst. Diagnosis, intervention and treatment of these infections are very important. This study aims at understanding the pathology involved for lower limb soft tissue infections, spectrum of organisms and different treatment modalities in various age group and gender.

**Methods:** 50 cases of lower limb soft tissue infections were included in this study. Detailed history, clinical examination, investigations, pre-operative preparation, intraoperative details and post-operative management were included.

**Results:** 94% patients were having history of trauma. 88% patients were having history of diabetes. *Staphylococcus aureus* was the most common (43%) organism cultured from swabs followed by *Pseudomonas* (36%) out of total cases. Minimum stay in hospital was of 4 days to a maximum of 34 days. Most of the patients were managed with regular dressing and debridement.

**Conclusions:** The patients sought treatment only when they had extensive lesions which affect their daily living. Health education regarding foot care forms an integral part of surgical management of lower limb soft tissue infections. Readmissions are mainly due to inadequate local control or fluctuating blood sugar levels and improper foot care due to illiteracy, poverty, ignorance and lack of adequate primary care facilities.

**Keywords:** Debridement, Diabetes complications, Injuries, Soft tissue infections

### INTRODUCTION

Soft tissue infections were first described in the Hippocratic era. In time various surgeons described the disease process in detail. The most well documented among these is the work of Joseph Jones an army surgeon, who reported 2,642 cases of "Hospital gangrene" with mortality rate of 46%.<sup>1</sup> Since then, multiple reports and classification systems have been

published in an attempt to define this disease better and achieve lower mortality rates with better outcomes. Skin and soft tissue infections are classified into complicated and uncomplicated infections.<sup>2</sup> Uncomplicated skin and soft tissue infections include cellulitis, simple abscesses, folliculitis, furuncles, carbuncles. They are superficial infections and have a low mortality and morbidity. They can be treated by antibiotic therapy and drainage procedures. Complicated skin and soft tissue infection

includes necrotizing soft tissue infections, complicated abscesses, infected ulcers, infections with significant underlying disease states that complicates response to treatment (diabetes mellitus) with high mortality and morbidity.<sup>3</sup> Necrotizing soft tissue infections by definition include presence of necrotic and devitalized tissue as part of the pathophysiology.<sup>4</sup> The principles of management, including early diagnosis with prompt and repeated surgical debridement, aggressive resuscitation and physiological support, broad spectrum antimicrobial drugs, support have been well documented. Lower limb soft tissue infection is quite common in diabetic patients and common cause being trauma. Most clinical assessments and line of treatment have been developed from either retrospective studies or from an author's own "clinical experience", illustrating the need for prospective studies with defined measurements of severity coupled to management issues and outcomes.<sup>5</sup> This article focuses mainly on clinico-diagnostic as well as treatment aspect of 50 cases of lower limb soft tissue infection.

### ***Aim and objectives***

The aim of the study was to understand the pathology of lower limb soft tissue infections and its relative distribution according to age, sex, mode of presentation, spectrum of organism isolated from patient going for debridement or fasciotomy and different treatment modalities in management of lower limb soft tissue infection.

## **METHODS**

### ***Study design, location and duration***

The present study was a retrospective study carried out in department of general surgery, Smt. B. K. Shah medical institute and research centre, Sumandeep Vidyapeeth Deemed to be University, Piparia, Vadodara, Gujarat, India. The study was done over a period of 08 months from December 2021 to July 2022.

### ***Inclusion criteria***

All the patients with lower limb soft tissue infection with or without diabetes mellitus and with bacterial etiology that required hospital admission were included in study.

### ***Exclusion criteria***

Any patient with lower limb soft tissue infection that did not require or did not willing to get admitted to hospital for the same.

### ***Sampling technique and sample size***

Random (all lower limb soft tissue infection patients coming to hospital outdoor patient department (OPD)/ emergency). Total 50 cases of lower limb soft tissue infections, including 24 cases of cellulitis, 14 cases of

gangrene, 9 cases of necrotizing fasciitis, 3 cases of abscess were included in this study.



**Figure 1: 68-year old diabetic (since 1 year) male patient having wet gangrene of left lower limb with history of trauma treated with below knee amputation.**



**Figure 2: 56-year old female diabetic (since 3 years) patient having traumatic ulcer on left thigh treated with debridement, followed by daily dressing and skin grafting.**

### ***Collection of data***

All patients were evaluated by taking detailed history, clinical examinations and necessary investigations according to case proforma. Preoperative preparation, intra-operative details and post-operative management were recorded. Categorization and tabulations of data was done according to age, sex, duration, diabetic or not, different presentations, organism cultured, treatment given, re-surgeries and re-admissions if any.

## **RESULTS**

### ***Age distribution***

Of 50 cases studied, youngest patient were 11 years and oldest was 80 years of age. Highest number of cases was found in age group of 51-60 years (30%), followed by 41-50 years (26%) (Table 1).

**Table 1: Age distribution.**

Age (years)	N	%
11-20	4	8
21-30	5	10
31-40	4	8
41-50	13	26
51-60	15	30
61-70	5	10
71-80	4	8
Total	50	100

**Sex distribution**

Of the 50 cases studied in this series, 38 (76%) cases were males and 12 (24%) cases were females (Table 2).

**Table 2: Sex distribution.**

Sex	N	%
Males	38	76
Females	12	24

**History of trauma and diabetes mellitus**

Total 47 cases in this series revealed a history of some kind of injury before the onset of lesion. Out of 50 patients in this series 44 patients had diabetes mellitus.

**Duration of diabetes mellitus**

Not all patients having lower limb soft tissue infections are aware of their diabetic status and were diagnosed after admission and routine workup. In my study 30% of the patients have diabetes since 6 to 10 years and 27% patients presented with duration of equal to or less than one year. Most of these patients were diagnosed post admission. Only five patients had diabetes for more than 20 years. (Table 3). Control of diabetes (assessed by glycosylated haemoglobin) is depicted in (Table 4).

**Table 3: Duration of diabetes (n=44).**

Duration of diabetes (years)	N	%
0-1	12	27
2-5	6	14
6-10	13	30
11-15	4	9
16-20	4	9
>20	5	11

**Table 4: Control of diabetes (HbA<sub>1c</sub>) (n=44).**

Control	N
Good (<7.0%)	9
Fair (7.0-9.0%)	11
Poor (>9.0%)	24

**Mode of presentation**

In this case series of lower limb soft tissue infections out of 50 patients 24 patients presented with cellulitis (48%), 14 patients presented with various gangrene like whole foot, toes of foot, whole leg, 9 patients presented with necrotizing fasciitis (18%), only 3 patients were presented with lower limb abscess like foot abscess, thigh abscess (Table 5).

**Table 5: Modes of presentation.**

Mode of presentation	N	%
Cellulitis	24	48
Necrotizing fasciitis	9	18
Gangrene	14	28
Abscess	3	6
Total	50	100

**Culture and sensitivity**

Staphylococcus aureus was the most common (43%) organism cultured from swabs followed by pseudomonas (36%) out of total 47 cases. We could not include 3 cases as we managed them conservatively by antibiotics and glycerine magnesium sulphate dressing. Other organisms isolated include proteus species, streptococci. Some cultures yielded more than one type of bacteria (Table 6).

**Table 6: Culture and sensitivity (n=47).**

Bacteria	N	%
Staphylococcus aureus	20	43
Pseudomonas	17	36
Proteus	6	13
Non hemolytic streptococci	4	8

**Duration of hospitalization and mode of treatment**

In this study minimum stay in hospital was 4 days and maximum stay was 34 days. Most of the patients were managed with regular dressing and debridement (Table 7).

**Table 7: Mode of treatment.**

Mode of treatment	N	%
Conservative (glycerine mgso <sub>4</sub> dressing and antibiotics)	3	6
Debridement and regular dressing	13	26
Incision and drainage	3	6
Ray amputation	9	18
Fasciotomy	9	18
Below knee amputation	4	8
Above knee amputation	1	2
Split thickness skin grafting	8	16

## DISCUSSION

Fifty cases of lower limb soft tissue infections were studied from December 2021 to July 2022. Only those cases require indoor admission are included in this study. It is seen that patients attending the hospital present fairly late.

### Age

In the present series the maximum incidence of lower limb soft tissue infection was in 6<sup>th</sup> decade (30%). Most of the patients in our study were diagnosed early as they present with cellulitis with small ulcer due to trauma which is more common in our country due to walking barefoot. Bladdiley et al recorded maximum incidence in 7<sup>th</sup> decade, while Oakley found that the maximum incidence was in 8<sup>th</sup> decade.<sup>6,7</sup> Otto et al found the average age was 59.5 years.<sup>8</sup>

### Sex

In the present study 38 were males and 12 were females. Male to Female ratio in the present study was 3.16:1. Bell has reported an incidence of 2:1.<sup>9</sup> However, Otto reports higher incidence in females than males.

Martin et al found higher incidence in men than women 1.2:1.<sup>10,11</sup> Thus, in most of the series there are more males than females. This is evidently related to the fact that diabetes, alcohol, smoking being more common in male than females. The incidence is more among males probably as they are the breadwinners of the family and are mostly working out door, which makes them more vulnerable for trauma and squeal.

### Duration of diabetes

The duration of diabetes could not well correlated due to the fact that many of our patients were diagnosed as diabetic for the first time upon presentation. Low socio-economic status and illiteracy are chief factors for late diagnosis of disease in our country. As patients in our country try to treat small lesions domestically, they do not attend hospital unless truly incapacitated. 13 (30%) of our patients had duration of 6 to 10 years while 27% patients had duration less than one year. 11% of the patients are chronic with the duration of more than 20 years.

### Control over diabetes

Glycosylated haemoglobin (HbA<sub>1c</sub>) was used as an indicator to assess control over diabetes (Table 8). 20% patients had good control of diabetes, 25% had fair control, 55% had poor control. Of these, diabetic neuropathy is common in patients who had poor control over diabetes.

**Table 8: Control over diabetes.**

Control	N	%
<b>Good (&lt;7.0%)</b>	9	20
<b>Fair (7.0-9.0%)</b>	11	25
<b>Poor (&gt;9.0%)</b>	24	55

### History of trauma

Total 47 cases of this series had a history of trauma, before the onset of lesion. Trauma is known to be initiating event in majority of the cases<sup>12</sup> because of the following factors; ischemia: due to ischemia, the parts which are traumatized will be under perfused, thus impairing healing process. Neuropathy: it results in loss of sensation and the patient will unaware of the injury and neglects it.

### Infections and diabetes

The incidence of Staphylococcus and Pseudomonas was nearly the same i.e., 43% and 36% respectively. Staphylococcus being the most common causative organism higher antibiotics like third generation cephalosporins and aminoglycosides were given for control of infections.<sup>13,14</sup> Coagulase produced by staphylococcus leads to thrombosis in small blood vessels in tissues around an area of infections and lead to destruction of more tissues.

Factors impairing wound healing in diabetics with infections: decreased resistance to infection in the presence of diabetes. Presence of slough: the tendons, ligaments, aponeuroses and fascia are comparatively less vascular and so get rapidly infected which favours the spread of infections to deeper planes. Oedema produced by inflammatory exudates impairs wound healing. Lack of proper tissue response due to peripheral neuropathy as patient is unaware of repeated trivial trauma. Thrombosis in small vessels due to microangiopathy impairs healing. Both these factors lead to non-healing of wound. Due to all these factors the disease spreads rapidly and takes a long time for the formation of line of demarcation.

### Clinical presentation

Commonest clinical presentation in our study is cellulitis of lower limb (48%) and least common were abscess (6%). It is mainly due to ignorance and illiteracy. In our patients bare foot walking, insect bite, careless attempts of nail removal are main precursor of variety of foot lesions.

### Duration of hospital stay

Longer periods of hospitalization are required due to the diminished resistance of the body, hyperglycaemia, impaired hormonal defence mechanisms and resistance of the organisms to the antibiotic therapy. VAC therapy

helps to contraction of the wound and in early disappearance of discharge and granulation tissue and hence shortens the hospital stay.

### **Treatment**

All patients presenting with lower limb soft tissue infections were start Broad spectrum antibiotics for control of infection and if patient is diabetic then they switched to injectable regular insulin subcutaneously every 6 hourly according to sugar level. Patients were educated about foot care. 21 patients were treated by surgical debridement out of which 13 were further treated by regular daily dressing and 8 with skin grafting (8 patients were given VAC therapy), 9 by ray amputation of single or multiple toes, 9 by fasciotomies, 4 by below knee amputation, 3 by incision and drainage, 3 by foot end elevation, glycerine mgso4 dressing and antibiotics (conservative), 1 by above knee amputation. The incidence of amputation in my study was comparable to that of the other studies over the years.

### **Limitations**

The present study has its own limitations as in patients included in this study, along with diabetes mellites no other systemic disease had been taken into consideration.

### **CONCLUSION**

Patients presenting with lower limb soft tissue infection previously had history of trauma, if diabetic then history of tingling and hypo/hyper aesthesia as a preceding factor for development of further lesions. The main presenting lesion in our study is cellulitis while least common were abscess. Out of diabetics more than 50 % of patients had poor diabetic control as shown by HbA<sub>1c</sub> values. In our study of lower limb soft tissue infection most common organism isolated on swab culture report is staphylococcus aureus. Third generation cephalosporins, metronidazole and an aminoglycoside were commonly used antibiotics for bacteraemia along the amoxicillin clavulanate. Injectable insulin is the best modality to curb the hyperglycaemia. After control of infection and removal of dead tissue, insulin requirement reduced on an average 3 to 4 days. Debridement was most commonly performed primary procedure. Among amputations, toe amputations were commonest. If there is extensive gangrene or extensive necrotizing fasciitis below knee or above knee amputation may be a last resort if all primary procedures have failed. It can also be undertaken as a primary procedure, in life threatening infections. Health education regarding foot care forms an integral part of surgical management of lower limb soft tissue infections. Readmissions are mainly due to inadequate local control or fluctuating blood sugar levels and improper foot care due to illiteracy, poverty, ignorance and lack of adequate primary care facilities.

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