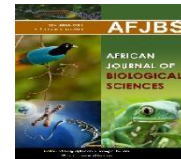


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A Study of Lower Limb Soft Tissue Infections: Modalities of Presentation, Management Strategies and Outcomes

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ABSTRACT

Background and Objectives: Skin and soft tissue infections (SSTIs) are one of the commonest infections among all infections in General surgery. Analyze the prevalence and significance of skin and soft tissue infections (SSTIs), focusing on lower limb soft tissue infections. The main aims and objectives of the study is to understand the pathology, identifying common organisms, and studying management modalities for lower limb SSTIs. **Methods:** A total 50 patients examine in present study. All patients who came to our hospital were present with lower limb swelling, redness or soft tissue infection were evaluated. Categorization and tabulations of data was done according to age, sex, duration, and diabetic or not, different presentations, organism cultured, treatment given, re-surgeries etc. Data was analyzed by using appropriate statistical software. **Results:** Total 50 patients were enrolled in the present study. Thirty-one patients revealed the history of trauma. In studied patients, 42 patients were diabetic. Out of 50 patients 30 patients presented with cellulitis (60%), 14 (28%) patients presented with gangrene at whole foot or at toes or whole leg, 2 (4%) patients presented with necrotizing fasciitis, only 4 (8%) patients were presented with lower limb abscess like foot abscess, thigh abscess. Staphylococcus aureus was the most common (58%) organism cultured from swabs. Ceftriaxone, metronidazole and amikacin were given to all the admitted patients as an empirical treatment. Debridement followed by daily dressing followed by split thickness skin grafting were done. Regular follow up was done for studied patients and outcome recorded. **Conclusion:** Male patients are more commonly affected than females. Cellulitis are the most common presenting feature among SSTIs. Trauma is the major risk factor for lower limb soft tissue infection. Diabetics are more vulnerable to lower limb soft tissue infection than non-diabetics are. Staphylococcus aureus is the most common organism responsible for lower limb soft tissue Infection, other organism responsible for SSTIs are proteus, pseudomonas, and streptococcus in my study. As the age increase, the incidence of SSTIs increase and the severity of the disease as well.

Keywords: Skin and soft tissue infections, Lower limb, Etiology, Treatment modalities, Surgical site infection.

INTRODUCTION

Skin and soft tissue infections (SSTIs) encompass a spectrum of inflammatory conditions affecting the integumentary system, with significant implications for morbidity and mortality. Among SSTIs, lower limb soft tissue infections pose unique challenges due to their anatomical location and potential for severe complications. The understanding of the pathology, etiology, microbial spectrum, and treatment modalities for lower limb SSTIs is crucial for effective clinical management and patient outcomes. Soft tissue infections have been extensively documented throughout history, with classifications evolving to differentiate between uncomplicated infections like cellulitis and complicated infections such as necrotizing soft tissue infections [1-2]. These infections can be caused by a variety of pathogens, including bacteria, and often require a multidisciplinary approach for optimal care. Early diagnosis and appropriate management strategies are essential to prevent progression to severe complications and improve patient prognosis [3-4].

The estimated incidence of soft tissue infection is 2.4% per 1000 persons year [5]. due to tend to resolve within seven to ten days. in the last decade a significant growing trend of SSTIs both in the community and healthcare settings with a dramatic increase of the economic burden for these diagnosis was observed. Several observational studies found that SSTIs are substantial causes of ambulatory and emergency department visits, and of hospitalization.

Pathogenicity is the capacity to initiate disease. Primary pathogens are capable of establishing infection and causing disease in previously healthy individuals with intact immunological defenses. Opportunistic pathogens rarely cause diseases in individual with intact immunological and anatomical defenses. In this context, this research article aims to investigate the intricate details of lower limb soft tissue infections, shedding light on the epidemiology, clinical presentation, microbial etiology, and evidence-based treatment options. By examining the latest research findings and clinical practices, this study seeks to contribute to the existing knowledge base and enhance the care provided to patients with lower limb SSTIs.

MATERIAL AND METHODS

The present study was carried out in general surgery department at tertiary care institutes during period of two years. A total 50 case of lower limb soft tissue infection admitted in our hospital were examined. For all studied patients, Preoperative preparation, intra-operative details and post-operative management were recorded.

Inclusion criteria: All the patients with lower limb soft tissue infection with or without diabetes mellitus and with bacterial etiology. All the patients with Age >10 years to 80 years were included in my study.

Exclusion criteria: Outdoor patient with SSTIs were excluded in from the study. All the patients with age less or equal than 10 year were excluded from the study

Analysis: All results were tabulated and analyzed using the appropriate software.

Mode of treatment: [Figure 1-5]



Figure 1: Debridement



Figure 2: Fasciotomy



Figure 3: Incision & Drainage



Figure 4: Split-Thickness Skin Grafts



Figure 5: Glycerin & MgSO₄)

RESULTS**Table 1: Distribution of gender**

| SEX | NUMBER OF CASES | PERCENTAGE% |
|--------|-----------------|-------------|
| MALE | 35 | 70% |
| FEMALE | 15 | 30% |

50 cases studied in this series, 35 (70%) cases were male cases and 15 (30%) were females [Table 1].

Table 2: History of diabetes mellitus

| HISTORY OF | NO OF PATIENTS | PERCENTAGE |
|----------------------|----------------|------------|
| TRAUMA / INSECT BITE | 31 | 62% |
| DIABETES MELLITUS | 42 | 56% |

31 cases in this series revealed a history of some kind of injury before the onset of lesion. Out of 50 patients in this series, 42 patients had diabetes mellitus [Table 2].

Table 3: Duration of diabetes

| DURATION OF DIABETES(YEARS) | NUMBER OF PATIENTS(N=42) | PERCENTAGE% |
|-----------------------------|--------------------------|-------------|
| NEWLY DIAGNOSED | 28 | 66.66 |
| 1-5 | 3 | 7.14 |
| 6-10 | 4 | 9.52 |
| 11-15 | 2 | 4.76 |
| 16-20 | 1 | 2.38 |
| >20 | 4 | 9.52 |
| TOTAL | 42 | 100 |

Not all patients having lower limb soft tissue infections were aware of their diabetic status and were diagnosed after admission and routine work up. In my study 66.66% patients were newly diagnosed for diabetes mellitus 7.14% patients had diabetes since 0 to 4 year 9.52% had diabetes since 6 to 10 year, 4.76% had diabetes since 11 to 15 years 2.32% had diabetes since 16 to 20 years and 9.52% had diabetes since more than 20 years [Table 3].

Table 4: Control of diabetes

| CONTROL | NO OF PATIENTS(N=42) | PERCENTAGE% |
|--------------|----------------------|-------------|
| GOOD (<7.0%) | 7 | 17 |

| | | |
|-----------------|----|----|
| FAIR (7.0-9.0%) | 13 | 31 |
| POOR (>9.0%) | 22 | 52 |

Table 5: Modes of presentation

| MODE OF PRESENTATION | NUMBER OF PATIENTS | PERCENTAGE% |
|----------------------|--------------------|-------------|
| CELLULITIS | 30 | 60 |
| NECROTIZING FASCITIS | 2 | 4 |
| GANGRENE | 14 | 28 |
| ABSCESS | 4 | 8 |
| TOTAL | 50 | 100 |

In my case series of lower limb soft tissue infections out of 50 patients 30 patients presented with cellulitis (60%), 14 (28%) patients presented with various gangrene like whole foot, toes of foot, whole leg, 2 (4%) patients presented with necrotizing fasciitis, only 4 (8%) patients were presented with lower limb abscess like foot abscess, thigh abscess [Table 5].

Plain x ray of the affected limb: This has been done for two reasons, one to study about any underlying bone involvement in severe forms of cellulitis; second, it helps to rule out the cases of osteomyelitis, which presents in the form of cellulitis. There were no bony abnormalities noted in all the enrolled patients.

Doppler study of arterial and venous system: Doppler study is principally to know about the circulatory status in the lower limb, which has the major role in the management of cellulitis. With this we studied about the arterial changes in the lower limb, vessels with alteration in the

flow pattern, level of arterial involvement and in cases where an arterial ulcer in the foot or the toe is the entry point for the infectious agent responsible for cellulitis.

Venous Doppler help in identifying venous reflux and venous stasis ulcer, which can also be the portal of entry for organism it is also, rule out deep vein thrombosis.

All the 50 patients in the study group were done Doppler evaluation of the arterial and venous system to study circulatory changes. 5 (10%) number of patients showed monophasic flow in distal or proximal arteries and calf vessels and venous insufficiency. The entire patient underwent BK/AK amputation.

Culture & Sensitivity

Table 6: Culture

| BACTERIA | NUMBER OF CASES (N=50) | PERCENTAGE% |
|-------------------------------|---------------------------|-------------|
| STAPHYLOCOCCUS AUREUS | 29 | 58 |
| PROTEUS | 10 | 20 |
| PSEUDOMONAS | 7 | 14 |
| NON HEMOLYTIC STREPTOCOCCI | 4 | 8 |

Table 7: Sensitivity

| ANTIMICROBI AL | PSEUDOMONAS (N=7) | | NON HEMOLYTIC STREPTOCOCCI (N=4) | |
|----------------------------|-------------------|--------------------|-------------------------------------|--------------------|
| | SUSCEPTIBLE | NOT SUSCEPTIBLE | SUSCEPTIBLE | NOT SUSCEPTIBLE |
| VANCOMYCIN | 6 | 1 | 3 | 1 |
| CEFTAZIDIME | 7 | 0 | 4 | 0 |
| CEFTRIAZONE | 7 | 0 | 4 | 0 |
| CEFUROXIME | 7 | 0 | 4 | 0 |
| ERYTHROMYC IN | 5 | 2 | 4 | 0 |
| CLINDAMYCIN | 4 | 3 | 4 | 0 |
| PENICILLIN | 6 | 1 | 2 | 2 |
| AMIKACIN | 3 | 4 | 3 | 1 |
| MEROPENAM/I MIP ENAM | 7 | 0 | 4 | 0 |

Table 8: Mode of treatment

| DEBRIDEMENT FOLLOWED BY: | NUMBER OF PATIENTS |
|--------------------------|--------------------|
|--------------------------|--------------------|

| | |
|---------------------------------|----------|
| 1.REGULAR DRESSING | 50(100%) |
| 2.RAY'S AMPUTATION | 12(24%) |
| 3.BELOW KNEE AMPUTATION | 3(6%) |
| 4.ABOVE KNEE AMPUTATION | 2(4%) |
| 5.SPLIT THICKNESS SKIN GRAFTING | 10(20%) |

Table 9: Other mode of treatment

| MODE OF TREATMENT | NUMBER OF PATIENTS |
|---|--------------------|
| INCISION AND DRAINAGE | 4(8%) |
| FASCIOTOMY | 7(14%) |
| GLYCERINE MGSO4 DRESSING AND ANTIBIOTIC | 6(12%) |

In above mode of treatment some patients underwent two or more than two mode of treatment E.g. debridement followed by daily dressing followed by split thickness skin grafting.

Blood transfusion: 36 Patients out of 50 patients underwent blood transfusion due to low hemoglobin, septicemia, and blood loss during debridement or dressing.

Follow up regularly taken follow up of the entire patient up to 4 month for every 15 days after date of discharge. Among diabetics 6 patient had developed recurrence SSTIs at the same site or different side out of 42 patients and among non-diabetics recurrence rate were in two patients. Recurrence rate were mainly depend upon low immunity, co morbidities, Poor hygiene, and illiteracy.

Duration of hospital stay: In this study, minimum stay in hospital was 6 days and maximum was 56 days. In addition, average duration of hospital stay was 22 days.

DISCUSSION

Fifty cases of lower limb soft tissue infections were studied from June 2019 to august 2021. only those cases require indoor admission are included in this study. it is seen that patients attending the hospital fairly present late.

Diabetes:

The duration of diabetes could not well correlated because 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. Not all patients having lower limb soft tissue infections were aware of their diabetic status and were diagnosed after admission and routine work up. in my study 66.66% patients were newly diagnosed for diabetes mellitus 7.14% patients had diabetes since 0 to 4 year 9.52% had diabetes since 6 to 10 year, 4.76% had diabetes since 11 to 15 years 2.32% had diabetes since 16 to 20 years and 9.52% had diabetes since more than 20 years. Glycosylated hemoglobin (HbA1c) was used as an indicator to assess control over diabetes. 17% patients had good control of diabetes, 31% had fair control, 52% had poor control of these, and Diabetic neuropathy is common in patients who had poor control over diabetes.

History of trauma [6]: 31(62%) cases of this series had a history of trauma, before the onset of lesion. Trauma is known to be initiating event in majority of cases because of the following factors – 1) Ischemia: Due to ischemia, the parts, which are traumatized, will be under perfused, thus impairing healing process. 2) Neuropathy: It results in loss of sensation and the patient will unaware of the injury and neglects it.

Infection & diabetes: Staphylococcus being the most common causative organism [7-8] higher antibiotics like third generation cephalosporin and aminoglycosides were given for control of infections. 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:

- a) Decreased resistance to infection in the presence of diabetes.
- b) Presence of slough: The tendons, ligaments, aponeuroses and fascia are comparatively less vascular and so get rapidly infected which favors the spread of infections to deeper planes. Edema produced by inflammatory exudates impairs wound healing.
- c) Lack of proper tissue response due to peripheral neuropathy as patient is unaware of repeated trivial trauma.
- d) Thrombosis in small vessels due to microangiopathy impairs healing. Both these factors lead to non-healing of wound.
- e) 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 was cellulitis (60%) of lower limb and least common was abscess (8%). In our patients who walk bare foot, insect bite, and careless attempts of nail removal are main precursor of variety of foot lesions.

Radiological investigation: There was no bony involvement noted in X ray local part in our study Bony involvement indicate some pathological condition in bone. On, Doppler examination five (10%) patients show AV insufficiency. Vascular supply necessary for limb survival and if lesion, occlusion, or insufficiency noted than have to think priority for vascular sufficiency or any further management.

Culture and sensitivity [9-11]: Staphylococcus aureus was the, most common organism (58%) cultured from swab followed by proteus (20%), pseudomonas (14%) and streptococci (8%), Empirical antibiotics (Ceftriaxone, Metronidazole and Amikacin) were given to all the patients as empirical treatment. Penicillin, Meropenem and Imipenem were the most sensitive (100%) antibiotic against microorganism. Staphylococcus aureus is a common human pathogen, which can colonize the skin, nose, and pharynx with anterior nares as the main reservoir and it is the most common organism cultured from SSTIs due to its ability to escape the innate immunity response such as phagocytosis.

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. Most of the patients were treated by surgical debridement out of which 50 (100%) were further treated by regular daily dressing and 10 (20%)with skin grafting 8 (16%)patients were given VAC therapy,12 (24%) by ray amputation of single or multiple toes , 7 (14%) by fasciotomies, 3 (6%) by below knee amputation , 6 (12%) by incision and

drainage, 6 (12%) by foot end elevation ,glycerin mgso4 dressing and antibiotics(conservative), 2 (4%) by above knee amputation.

Blood transfusion: In 36 (72%) patients due to septicemia, low HB and/or blood loss during debridement or blood loss during dressing. Normal hemoglobin leads to improve in healing and decrease hospital stay. If there, any amputation required than it may decide on vascular blood supply and line of demarcation.

Duration of hospital stay: Longer periods of hospitalization are required due to the diminished resistance of the body, hyperglycemia, impaired hormonal defense 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. After follow up recurrence were mainly due to uncontrolled Blood sugar, poor hygiene, and illiteracy.

CONCLUSION

In conclusion, this research sheds light on the intricate aspects of lower limb soft tissue infections, emphasizing the importance of early diagnosis, appropriate management strategies, and the impact on patient outcomes. By exploring the pathology, etiology, microbial spectrum, and treatment modalities for lower limb SSTIs, this study contributes to the existing knowledge base in the field of soft tissue infection. The findings underscore the significance of a multidisciplinary approach, tailored treatment regimens, and the need for further research to enhance the understanding and management of lower limb soft tissue infections.

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