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Original Research Article

Adequate incision and proper drainage gives better outcome in cellulitis patients

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ABSTRACT

Background: We assessed the outcome of adequate incision and proper drainage of toxic fluid in the management of cellulitis patients in addition to the standard conservative approach of limb elevation, immobilisation and use of antibiotics.
Methods: We conducted a retrospective cohort study in 150 patients of both sexes of age group 15-75 years admitted with cellulitis undergoing incision and drainage as an emergency procedure. Aetiologies, comorbidities and changes in levels of total leucocyte count, urea and creatinine were checked preoperatively and after surgical drainage. Management of the incision site and ulcer was done on follow up after the initial toxaemia resolved.
Results: One hundred fifty patients including 98 males and 52 females of age group 15-75 years were included in this study. The most common site of cellulitis was found to be lower limb in 69 followed by upper limb in 40 cases. The aetiology was mostly traumatic in 68 patients followed by diabetes in 40 cases. Incision and drainage were performed in 108 cases and 42 cases needed debridement. Reduction in the total counts and improvement in the renal functions were seen in the patients. Upon follow up the patients presented with a healed ulcer with granulation tissue at base 68 of which were managed using SSG and 35 needed secondary suturing. There was no mortality seen in the study although 10 patients had to undergo further debridement and 2 patients needed a lower limb amputation.
Conclusions: Cellulitis is one of the most commonly encountered pathologies in the outpatient department and is often managed conservatively. Extensive spread and complications can lead the patient to land in sepsis and multiorgan dysfunction. Thus, adequate incision and proper drainage of toxic fluids can prevent such complications and give better outcome for the patient.

Keywords: Cellulitis, Conservative, Drainage, Sepsis, Ulcer

INTRODUCTION

Cellulitis is the non-necrotising cutaneous bacterial infection invading the skin, dermis and subcutaneous layer of soft tissue. It can involve any part of the body including the upper and lower limbs, chest, anterior abdominal wall and even buttocks.[1,2]

It has association with multiple risk factors like trauma, diabetes, IM injections, insect bites, thorn pricks, previous surgeries, chemo, radiotherapy and other immunocompromised status.[2,3]

These infections are mainly caused by gram positive cocci like *Streptococcus pyogenes* and *Staphylococcus aureus* although they also occur frequently following infections of non-group A beta haemolytic streptococci and other gram-negative bacilli.[4,5] These bacteria adhere to the host cells, invade them and produce toxins which produces an acute inflammatory response involving

erythema, warmth, pain and swelling without the formation of abscess or involvement of the underlying muscle, fascia or bones although their involvement is a part of overlapping complications of cellulitis.[6,7]

Early cellulitis changes can be managed in the outpatient department with oral antibiotics and other conservative methods including analgesics, limb elevation and hygroscopic dressings but hospitalization and use of parenteral antibiotics are needed for patients with co-morbidities or in later stages with concurrent complications like blisters, purulent discharge, myositis, necrotising fasciitis or toxic shock syndrome.[8]

These patients with systemic signs of toxicity (fever >100.5°F/38°C, hypotension, sustained tachycardia), extensive spread or rapid progression needs timely intervention in form of surgical drainage of toxic fluid and abscess for better recovery and prevention of life-threatening complications like septic shock, multiorgan dysfunction and even death in certain cases.[9]

We aim to establish that cellulitis can progress to a state of systemic sepsis and generalised toxaemia which can lead to multiorgan dysfunction if not managed properly.

Our objective was the early assessment of toxic state of the patient with medical management by culture specific antibiotics along with proper surgical intervention by giving adequate liberal incision at the site of cellulitis and giving a proper channel for drainage of toxic fluid and abscess which prevents further complications, saves limb and life and give overall better outcome for the patient.

METHODS

This retrospective observational study was conducted on 150 patients who were operated for cellulitis and its complications during January 2023 to December 2023 in the Department of General Surgery of S. M.S. Medical College and Hospital, Jaipur after taking approval from ethical committee from the institute.

There were 150 patients including 98 males and 52 females of age group 15-75 years. We observed the total leucocyte counts and renal functions of patients on admission and after the operative procedure.

We calculated the mean age and analysed data in percentage and represented them in form of various tables and charts. After collecting the demographic data, clinical features, physical examination and co-morbidities, all the patients were kept on empirical antibiotic therapy with Inj. Linezolid 600 mg TDS and Clindamycin 600 mg TDS along with conservative management of limb elevation and dressing with antiseptic materials.

After a complete preoperative workup including a complete blood count, biochemistry and viral markers, the patient was planned for the operative procedure depending upon the clinical condition and site of cellulitis. Swab from the cellulitis site, blood and urine cultures were sent for culture and antibiotic sensitivity.

Inclusion criteria

Patients admitted to department of general surgery with cellulitis irrespective of the aetiology or site were included in the study.

Exclusion criteria

Patients who were managed conservatively or the patients who did not gave not gave consent for operative procedure and children less than 15 years of age were excluded.

Operative procedure

Adequate incision is given along the most dependent part of the limb or abscess cavity for adequate drainage and preferably along the skin tension line for better scar. After adequate drainage and sending culture for microbiological analysis, all the cavities are communicated and local septa broken to prevent any residual toxic foci.

The wound is then irrigated with normal saline to remove all the cellular debris and surface pathogens, promote healing from inside and to prevent unwanted healing over an infected tract.[10,11]

After thorough irrigation, an antiseptic agent is preferably applied like 10% povidone iodine which mostly acts on highly resistant gram-positive microorganisms and it destroys the cell wall, inhibits the release of endotoxins, exotoxins and other tissue-destroying enzymes.[12] About 3% hydrogen peroxide (H_2O_2) is an oxidizing agent which produce reactive oxygen species and react with membrane lipids and destroy bacteria without affecting the wound epithelialization.[13]

Other agents like sterile water, local topic antibiotics, chlorhexidine, sodium hypochlorite (Dakin's solution) or EUSOL (Edinburg university solution of lime) may also be used.[14,15]

After irrigation, the wound is then packed with sterile roller bandage soaked in an antiseptic solution obliterating whole of the cavity and all spaces to prevent recurrence. Cotton roll is then applied along the entire length of the incision and supra dressed with roller bandage.

The operative findings, procedure and post operative progress during the entire hospital stay and management of any complications was done. Antibiotics were changed according to culture and sensitivity report and daily dressing was done with serial debridement if needed.

After discharge follow up of the patient was done on OPD basis for further management.

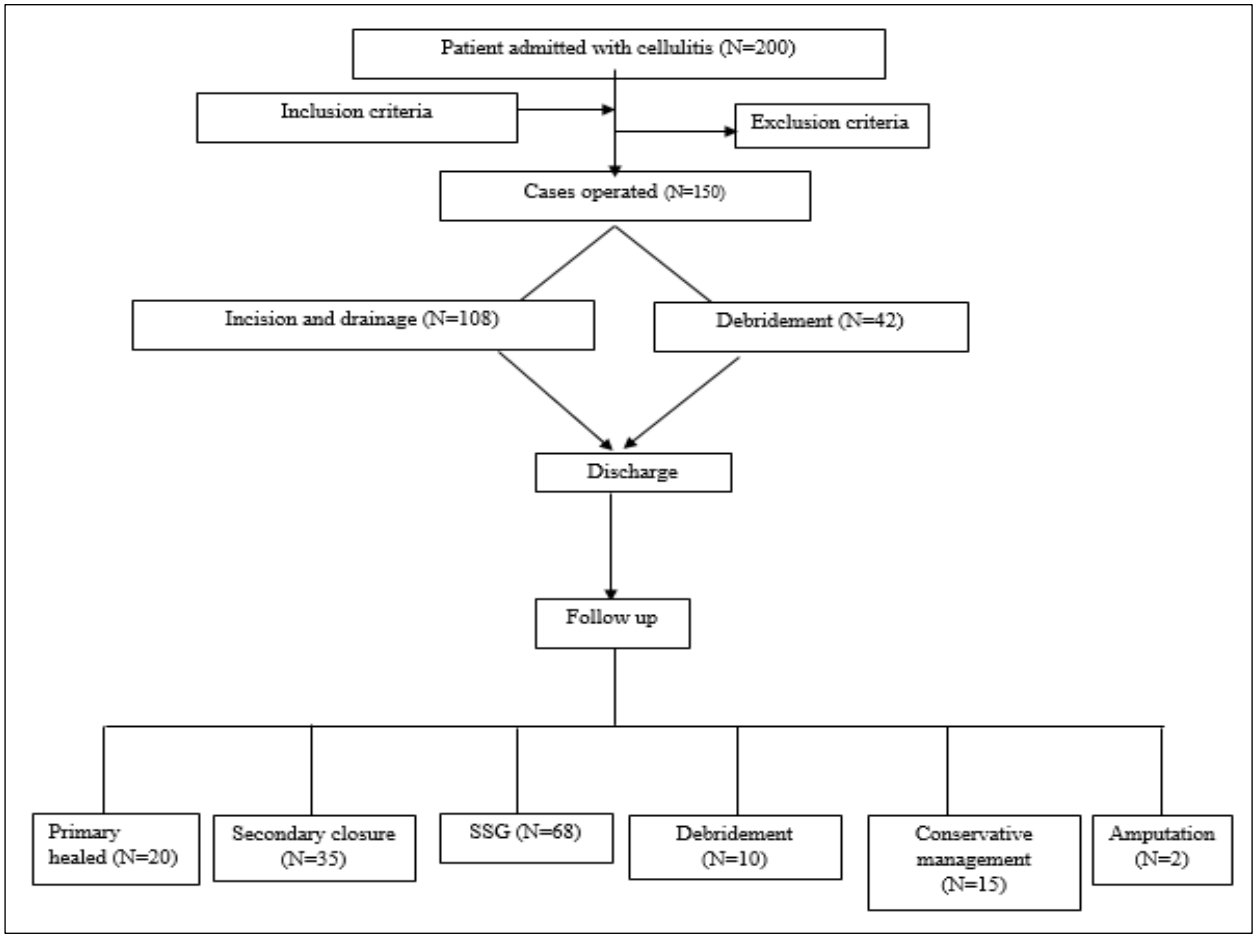

Figure 1: Study flow-chart.

RESULTS

About 150 patients were included in this study 98 (65.33%) male and 52 (34.67%) female, maximum number of patients were from the age group 46-60yrs, the median age being 49.5 years (range 15-75) as indicated by Table 1. The age and sex incidence are also represented in Figure 1.

The various aetiologies for cellulitis are shown as in Table1, the most common of which was found to be traumatic in 60 cases (40%) followed by diabetes in 38 cases (25.33%).

The various cellulitis sites are mentioned in Figure 1 maximum of which was seen in lower limb in 69 (46%) of patients (Figure 2).

Among the 150 patients as shown in Table 2, 123 (82%) were operated as an emergency procedure and only 27 cases (18%) were taken up for elective surgery when the conservative management and iv antibiotics were not able to resolve the cellulitis changes. Of the 150 patients operated, incision and drainage were done for 108 (72%) of the cases and 42 cases (28%) needed debridement.

As indicated by Table 3, only 38 (25.33%) of the patients had normal leucocyte counts before the operative procedure which increased to 113 (75.34%) after proper drainage of toxic fluid indicating resolving sepsis state.

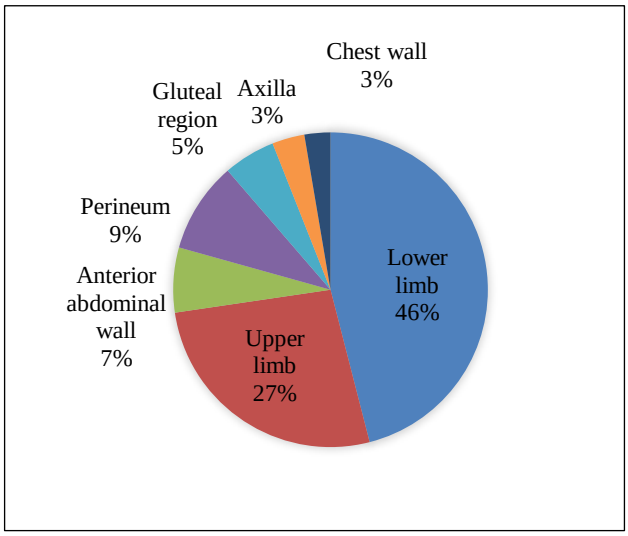

Figure 2: Site of cellulitis.

Table 1: Patient characteristics.

Variables	Number of patients (n=150)	Percentage
Gender		
Male	98	65.33
Female	52	34.67
Age (years) Mean	49.5	
<15	0	0
15-30	35	23.33
31-45	29	19.33
46-60	47	31.34
61-75	39	26
Aetiology		
Traumatic	60	40
Diabetic	38	25.33
Post IM injection	13	8.67
Insect bite	15	10
Thorn and other plant pricks	5	3.33
Post-operative	6	4
Immunocompromised status	5	3.33
Secondarily to underlying sepsis	5	3.33
Idiopathic	3	2

We found that initially there was an elevation in serum creatinine due to sepsis in total 67 patients (44.67%) which resolved postoperatively to 27 patients (18%). There was also a normalization in the urea levels from 53.33% preoperatively to 43.33% after the operative procedure (Table 3).

On follow up of the patient during regular OPD visits within 3 months as shown in Table 4, we observed the surgical site and the ulcer formed as shown in Figure 3 and 68 patients (45.34%) needed split skin grafting for management of the ulcer as shown in Figure 4 while 35 (23.33%) just needed a secondary suturing (Table 4).

Figure 3 (A and B): Figure demonstrating extensive lower limb cellulitis with necrotising fasciitis.

Two patients needed a lower limb amputation, one at the level above ankle and one below knee in view of gangrene and 10 patients (6.67%) were readmitted for further debridement of necrotic debris and slough (Table 4).

Table 2: Operative characteristics.

Variables	Number of patients (n=150)	Percentage
Surgery		
Emergency procedure	123	82
Elective procedure	27	18
Operative procedure		
Incision and drainage	108	72
Debridement	42	28
Total	150	100

Figure 4 (A and B): Post operative images of incision site lined by healthy granulation tissue.

Figure 5: Intraoperative picture of ulcer managed by split skin grafting.

Table 3: Laboratory investigations.

Variables	No of patients before incision (%)	No of patients on discharge (%)
Total leucocyte counts (counts/mm^3)		
<4000	10 (6.67)	5 (3.33)
4000-11000	38 (25.33)	113 (75.34)
11000-18000	67 (44.67)	30 (20)
18000-25000	25 (16.66)	2 (1.33)
>25000	10 (6.67)	0
Serum creatinine (mg/dl)		
<1.2	83 (55.33)	123 (82)
1.2 - 3	40 (26.67)	23 (15.33)
3-6	20 (13.33)	4 (2.67)
>6	7 (4.67)	0
Serum urea (mg/dl)		
<40	70 (46.67)	85 (56.67)
40-80	43 (28.67)	48 (32)
81-120	15 (10)	10 (6.67)
121-160	7 (4.67)	5 (3.33)
161-200	5 (3.33)	2 (1.33)
>200	10 (6.66)	0

Table 4: Follow up.

Management on follow up	Number of patients (%)
Healed primarily	20 (13.33)
Secondary closure	35 (23.33)
Split skin grafting	68 (45.34)
Further debridement	10 (6.67)
Dressing and conservative management	15 (10)
Amputation	2 (1.33)
Total	150 (100)

DISCUSSION

In this retrospective observational study of 150 cases consisting of 98 males and 52 females we found the maximum number of cases in age group of 46-60 yrs. Namara et al conducted a study and found the incidence higher with age with highest in patients with above 80 years.[16]

We found that most common reason for cellulitis was trauma in 60 cases (40%) followed by diabetes in 38 cases (25.33%). Similar findings were reported by Badipatla et al which showed trauma as major cause of cellulitis in 68% of patients.[17]

We observed that in 46% of the patients' lower limbs and in 27% upper limbs were affected. This was also noted in the study conducted by Collazos et al where the most common sites of involvement were the lower (74.8%) and upper (13.5%) extremities.[18]

Deshpande et al conducted a study where 35.38% cases were treated surgically with release incision, debridement or both as compared to our study where all cases were managed surgically with incision given in 72% and debridement done in 28% of cases.[19]

Cellulitis due to various reasons can land the patient in sepsis and multiorgan dysfunction. In our study we found that operative procedure in addition to iv antibiotics resolves the initial toxaemia and there is overall improvement in the total counts and renal functions of the patient.[20] The mean hospital stay in this study was 9 days which resembled the Halpen case control study on 150 patients where the mean duration of hospital stay was 10 days.[21]

During the follow up of the patients in OPD for the further management of wound 13.33% were closed primarily, 10% of cases needed regular dressings while 23.33% and 45.34% cases needed secondary suturing and split skin grafting respectively as opposed to the study conducted by Edwards et al where 28% of patients were managed with split skin grafting and 72% of the wounds healed by secondary intention.[22-24]

Proper identification of deadly limb along with iv antibiotics and proper surgical management with liberal incision and drainage of toxic fluid and abscess cavity is essential to prevent systemic spread of sepsis and to prevent further complications.

The limitations of our study are largely attributable to the sample size and the single institutional nature of our investigation which is prone to selection bias.

CONCLUSION

In this study we conclude that cellulitis due to multifactorial reasons causes various complications due to the underlying septic foci which needs to be tackled properly using iv antibiotics along with proper surgical management and treatment of co-morbidities for overall better outcome, reducing morbidity and salvaging limbs and lives.

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