International Surgery Journal
Deshpande SG et al. Int Surg J. 2017 Aug;4(8):2751-2755
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20173412

Original Research Article

Limb cellulitis in rural setting in India: a case control study

Swati G. Deshpande*, Ankur Grover, Vinay V. Shahapurkar, Raju K. Shinde

Department of General Surgery, Jawaharlal Nehru Medical College (JNMC), Sawangi (M), Wardha - 442004, Maharashtra, India

Received: 31 May 2017
Accepted: 27 June 2017

***Correspondence:**
Dr. Swati G. Deshpande,
E-mail: dswat86@gmail.com

ABSTRACT

Background: Cellulitis is the bacterial infection of dermis and the subcutaneous layer. Limb cellulitis is the most common and yet least studied form. This study aims at studying clinical profile, management and complications of limb cellulitis in inpatients at an Indian rural hospital.
Methods: After taking institutional ethics committee approval, patients admitted to Jawaharlal Nehru medical college and Acharya Vinoba Bhave rural hospital, Wardha, Maharashtra, India with limb cellulitis during April 2007 to September 2009 were included. Their history, clinical examination and photographs were noted. They were treated conservatively or surgically depending on severity and followed up till complete recovery or 30 days after discharge whichever was earlier.
Results: 130 patients i.e. 40 (30.77%) females and 90 (69.23%) males were included in this study with farming being commonest occupation. Commonest risk factor was bare foot working while least common was venous insufficiency. Right lower limb was frequently affected. Local swab cultures were sterile in 74 (56.92%) patients while *E. coli* grew predominantly in positive cultures and all blood cultures were negative. 84 (64.62%) patients were treated conservatively and only 46 (35.38%) required surgical intervention. 125 (96.15%) patients showed complete recovery while 5 (3.85%) patients succumbed to illness due to sepsis and multiorgan dysfunction syndrome.
Conclusions: Limb cellulitis is a common disease to outpatient department and needs admission in patients with elevated risk factors. Most cases can be managed conservatively and seldom surgical intervention. Though majority can be cured completely, few with elevated risk succumb to the disease.

Keywords: Cellulitis, Limb cellulitis

INTRODUCTION

Cellulitis is the bacterial infection involving dermis and the subcutaneous layer. It can occur in any part of body but is most common in the lower extremities followed by face, hands, torso, neck and buttocks respectively.[1,2] Various risk factors for cellulitis include traumatic injury, leg ulcers, intertrigo, overweight, lymphedema, diabetes mellitus, vasculitis, previous surgery, radiotherapy and immunocompromised states.[2,3] Causative organisms for cellulitis include *Streptococcus pyogenes* and *Staphylococcus aureus* followed by β hemolytic streptococci and gram negative bacilli.[4,5] Exact incidence of cellulitis in India is unknown but in USA, it is a common infection affecting 2-3 persons/100 persons/year. Stulberg et al described clinical hallmarks of cellulitis as, warmth, erythema, edema with nonpalpable margins and tenderness of affected area, associated lymphangitis, regional lymphadenopathy and fever.[6]

Differential diagnosis of cellulitis includes lower leg edema, hematoma, necrotizing fasciitis, lymphedema, deep venous thrombosis, compartment syndrome, pyoderma gangrenosum and pretibial myxoedema (Cox et al).[7]

Cellulitis is a clinical diagnosis but may require investigations to know the severity as in leucocytosis, raised CRP levels, ASO titres in suspected Streptococcal infections, X-ray to rule out gas gangrene or underlying osteomyelitis (Trubo R) or necrotizing fasciitis.[8]

Color Doppler is done to rule out DVT/ Venous insufficiency. Swab cultures are done to isolate the causative organism and blood cultures to know if bacteraemia is present. Eron has devised a classification system to guide admission to hospital and treatment decisions for patients with cellulitis as under (Table 1).[9]

Other conservative measures include limb elevation, magnesium sulphate and glycerine hygroscopic dressings, anti-inflammatory-analgesics, antipyretics along with medications for patient's co morbidity.

Most cellulitis recovers completely, however few may show complications including gangrene of infected parts, lymphangitis, lymphadenitis, shock, acute glomerulonephritis and renal failure, acute respiratory distress syndrome, sub-acute bacterial endocarditis and rarely death.

Most cellulitis heals completely however in patients of venous insufficiency, lymphedema, diabetes mellitus, immunocompromised patients can have recurrences. However, antibacterial prophylaxis in such patients is controversial. Hence, it is not recommended.

Table 1: Eron's classification of patients.

Class	Admission or treatment decisions
I	Patient has no signs of systemic toxicity, has no uncontrolled co morbidities and can usually be managed with oral antimicrobials on an outpatient basis
II	Patients are either systemically ill or systemically well but with co morbidity such as peripheral vascular diseases, chronic venous insufficiency or morbid obesity which may complicate or delay resolution of their infection.
III	Patients may have significant systemic upset such as acute confusion, tachycardia, tachypnoea, and hypotension or may have unstable co morbidities that may interfere with response to therapy or have a limb threatening infection due vascular compromise.
IV	Patients have sepsis syndrome or severe life-threatening infection such as necrotising fasciitis.

Class II, III and IV require hospital admission and IV drug therapy with or without surgical intervention.

METHODS

This was a prospective study carried out at carried out at Jawaharlal Nehru medical college (JNMC) and Acharya Vinoba Bhave rural hospital (AVBRH), Wardha, Maharashtra, India between April 2007 and September 2009.

The inclusion criteria were to study patients qualifying definition of limb cellulitis as per Stulberg's criteria admitted to the hospital. Exclusion criteria were all patients who denied admission, did not require admission, had received treatment elsewhere, had recurrence or did not consent to be a part of the study.

Patients satisfying the criteria were screened, history noted and physical examination carried out. Clinical photographs were taken.

Laboratory investigations were carried out (complete blood count, liver and renal function test). Swab and blood cultures were sent for culture and antibiotic sensitivity. Additional investigations included X-ray and color doppler when indicated.

Patients were managed conservatively with glycerin magnesium-sulfate dressing and empirical intravenous antibiotics (inj Cefotaxime/ inj Gentamycin/ inj Metronidazole/ inj Amikacin) initially and then as per culture sensitivities or with surgical debridement with or without skin grafting and IV antibiotics. All patients were monitored for response to treatment and resolution of cellulitis.

RESULTS

This study consisted of 130 in patients of limb cellulitis managed at JNMC and AVBRH, Sawangi (Meghe), Wardha, Maharashtra, India between April 2007 and September 2009. Following observations were noted: there were 40 females (30.77%) and 90 males (69.23%) included in the study.

Most common age group affected was 51-60 years (32 patients, 24.62%) followed by 61-70 years (27 patients,

20.77%). Least affected was 1-10 years group. Farmers were most commonly affected (101 patients, 77.7%) followed by labourers (15 patients, 11.5%) and housewives were least affected (one patient, 0.8%).

Table 2: Month-wise distribution of patients with cellulitis.

Month	Number of patients	%
January	16	12.31
February	15	11.54
March	3	2.31
April	7	5.38
May	6	4.62
June	9	6.92
July	20	15.38
August	17	13.08
September	9	6.92
October	10	7.69
November	8	6.15
December	10	4.69
Total	130	100

Majority of patients (55 patients, 42.30%) presented during harvesting season of June to September. Right lower limb was most commonly involved (54 patients, 41.54%) followed by left lower limb (37, 28.46%), right upper limb (19, 14.62%) and left upper limb (13, 10%). Bilateral lower limbs were involved in 7 patients (5.38%).

However, no patient had bilateral upper limb involvement. In lower limb, leg was affected in 72 patients (55.38%) whereas foot was involved in 26 patients (20.0%) (Figure 1).

Figure 1: Cellulitis right lower limb.

In upper limb, hand was involved in 23 patients (17.69%) followed by forearm in 9 patients (6.92%). No patient was involved of upper arm. Total 98 (75.38%) patients had lower limb involvement and 32 (24.62%) patients had upper limb involvement.

Most common risk factor was bare foot walking as seen in72 patients (55.38%) followed by diabetes (14, 10.77%), direct trauma (13,10.00%), dermatitis (8, 6.15%), insect bite, lymphedema and working with bare hands (6 each, 4.62%). Least common risk factor was venous insufficiency seen in 5 patients (3.85%).

All patients had swelling, redness and pain as presenting features whereas fever was present only in half of patients (62 patients, 47.69%). Less common features were discharge (47 patients, 36.15%), color change (25 patients, 19.23%), nausea (17 patients, 13.07%), vomiting (4 patients, 3.07%) and malaise (2 patients, 1.53%).

Cultures from local site were variable as seen in the Table 3. Most cultures (74 patients, 56.9%) had negative growth. Most common organism grown was *E. coli* and least common was coagulase negative *Staphylococcus aureus*. 3 patients (2 with *Pseudomonas* + *Klebsiella* and 1 with *Staphylococcus* + *Klebsiella*) had mixed infections (Table 3).

Table 3: Local swab culture growths.

Organism	Number of patients	%
No growth	74	56.9
E. coli	23	17.69
Staph aureus	12	9.23
Klebsiella	5	3.85
Streptococci	4	3.08
Pseudomonas	4	3.08
B haemolytic streptococci	3	2.31
Coag neg staph	2	1.54
Pseudomonas + Klebsiella	2	1.54
Staph + Klebsiella	1	0.77
Grand total	130	100

None of the patients had positive blood cultures. Most patients were managed conservatively (84, 64.62%) and 46 (35.38%) were treated with surgery (amputation-1, release incision-18, release incision + debridement-2 and debridement in 25 patients) (Figure 2).

Figure 2: Conservative management- magnesium sulfate dressing right lower limb.

Local complications including compartment syndrome (16 patients, 12.31%) and necrotizing fasciitis (25,

19.23%) were seen in 41 patients. 89 (68.46%) patients had no local complications. Systemic complication of multiple organ dysfunction syndromes (acute renal failure and/or acute respiratory distress syndrome) was seen in 10 (7.69%) patients. Of these 10 patients, 5 (3.84%) patients succumbed to disease.

Table 4: Follow-up at 15 days:

Follow-up status	Number of patients	%
Complete recovery	91	70
Mild indurations, required simple dressing	1	0.77
Mild edema, magnesium sulphate dressing	2	1.54
Indurations	4	3.08
Edema	16	12.31
Redness	7	5.38
Small ulcer at grafted site needed dressing	4	3.08
Expired	5	3.85
Total	130	100

Figure 3: Partially resolved cellulitis right lower limb.

91 (70%) had complete recovery at 15 days after discharge. Remaining 39 (30%) were followed up at 30 days. 125 (96.15%) patients showed complete recovery and 5 (3.84%) had succumbed to disease at 30 days follow-up.

Figure 4: Completely resolved cellulitis right lower limb.

DISCUSSION

This study consisted of 130 in patients of limb cellulitis managed at Jawaharlal Nehru medical college and Acharya Vinoba Bhave rural hospital, Sawangi (Meghe), Wardha, Maharashtra, India between April 2007 and September 2009. M: F = 2.25:1

Most common age group affected was 51-60 years (32 patients, 24.62%) followed by 61-70 years (27 patients, 20.77%). Least affected was 1-10 years group. Farmers were most commonly affected (101 patients, 77.7%) followed by labourers (15 patients, 11.5%) and housewives were least affected (one patient, 0.8%).

Majority of patients (55 patients, 42.30%) presented during harvesting season of June to September. This correlates with the fact that most common occupation of the population catered by the hospital was farming.

Right lower limb was most commonly involved (54 patients, 41.54%) followed by left lower limb (37 patients, 28.46%), right upper limb (19 patients, 14.62%), left upper limb (13 patients, 10%). Bilateral lower limbs were involved in 7 patients (5.38%). However, no patient had bilateral upper limb involvement.

In lower limb, leg was affected in 72 patients (55.38%) whereas foot was involved in 26 patients (20.0%). In upper limb, hand was involved in 23 patients (17.69%) followed by forearm in 9 patients (6.92%). No patient was involved of arm. Total 98 (75.38%) patients had lower limb involvement and 32 (24.62%) patients had upper limb involvement.

Most common risk factor was bare foot walking as seen in 72 patients (55.38%) followed by diabetes (14, 10.77%), direct trauma (13,10.00%), dermatitis (8, 6.15%), insect bite, lymphedema and working with bare hands (6 each, 4.62%). Least common risk factor was venous insufficiency seen in 5 patients (3.85%). These findings were consistent with various earlier studies.[10,11]

All patients had swelling, redness and pain as presenting features whereas fever was present only in half of patients (62, 47.69% patients). Less common features were discharge (47, 36.15% patients), color change (25, 19.23% patients), nausea (17, 13.07% patients), vomiting (4, 3.07% patients) and malaise (2, 1.53% patients). Thus, all patients may not present with all criteria and swelling, redness and pain form the main complaints in all patients. Cultures from local site were variable as seen in the Table 3. Most cultures (74 patients, 56.9%) had negative growth.

Most common organism grown was *E. coli* and least common was coagulase negative *Staphylococcus aureus*. 3 patients (2 with *Pseudomonas* + *Klebsiella* and 1 with *Staphylococcus* + *Klebsiella*) had mixed infections. The role of streptococci in our cases is in accord with other

reports, but this organism tends to be neglected partly because of the difficulty in obtaining cultures from intact skin. Perhaps for this reason, *S. aureus* seems to account for greater proportion of positive cultures than the proportion of cases in which it is perceived to be the major pathogen.[12,13]

None of the patients had positive blood cultures. Most of the patients were treated conservatively (84, 64.62%) with IV antibiotics, magnesium sulfate glycerine dressings and analgesics-antipyretics.

Only 46 (35.38%) patients needed surgery with 25 (19.23%) patients requiring debridement, 18 (13.84%) patients underwent incision, 2 (1.53%) patients requiring incision and debridement and only 1 (0.76%) landed up with amputation.

All patients were started on inj Cefotaxime and inj Amikacin empirically with Inj Metronidazole if anaerobic infection was suspected and later modified as per culture sensitivity report. 33 patients received inj Amikacin and inj Cefoperazone-Sulbactam, 2 patients received inj Cefoperazone-Sulbactam + inj Tobramycin, 31 were treated with inj Amoxyclavulinate + inj Amikacin, 11 with inj Cefotaxime + inj Amikacin, 9 received inj Ceftazidime + inj Amikacin, 15 patients needed inj Ceftriaxone + inj Tobramycin+ inj Metronidazole, 6 patients with inj Ceftriaxone + inj Metronidazole, 9 patients with Inj Cefotaxime-Sulbactam + inj Tobramycin and 14 patients received inj Piperacillin-Tazobactam.

Local complications including compartment syndrome (16 patients, 12.31%) and necrotizing fasciitis (25, 19.23%) were seen in 41 (31.53%) patients. 89 patients (68.46%) had no local complications.

Systemic complication of multiple organ dysfunction syndromes (acute renal failure and/or acute respiratory distress syndrome) was seen in 10 patients. Of these 10 (7.69%) patients, 5 (3.84%) patients succumbed to disease. 91 (70%) had complete recovery at 15 days after discharge. Remaining 39 (30%) followed up at 30 days. 125 (96.15%) patients showed complete recovery and 5 (3.84%) had succumbed to disease at 30 days follow-up.

CONCLUSION

Present study underlines the importance of Streptococci, lymphedema and tinea pedis in the etiology of leg cellulitis.

Whilst it is important to consider staphylococci and other organisms, especially in cases with preceding wounds, severe cellulitis or other medical disorders, treatment must include an antistreptococcal agent.

Injuries due to farm injuries are a peculiar risk factor for farmers and there is a need to train rural population to take safety measures including protective shoes and gloves.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Dupuy A, Benchikhi H, Roujeau JC, Bernard P, Vaillant L, Chosidow O, et al. Risk factors for erysipelas of leg (cellulitis): case control study. BMJ. 1999:318(7198):1591-4.
2. Roujeau JC, Sigurgeirsson B, Korting HC, Kerl H, Paul C. Chronic dermatomycosis of foot as risk factors for acute bacterial cellulitis of the leg: A case control study. Dermatol. 2004:209(4):301-7.
3. Semel JD, Goldin H. Association of athlete's foot with cellulitis of lower extremities: diagnostic value of bacterial cultures of ipsilateral space samples. Clin Infect Dis. 1996:23(5):1162-4.
4. Carratala J, Roson B, Fernandez-Sabe N, Shaw E, Del Rio O, Rivera A, et al. Factors associated with complications and mortality in adult patients hospitalized for infectious cellulitis. Eur J Clin Microbiol Infect Dis. 2003:22(3):151-7.
5. Eriksson B, Jorup-Ronstrom C, Karkkonen K, Sjoblom AC, Holm SE. Erysipelas: clinical and bacteriologic spectrum and serological aspects. Clin Infect Dis. 1996:23(5):1091-8.
6. Stulberg DL, Penrod MA, Blatny RA. Common bacterial skin infections. Am Fam Physician. 2002:66(1):119-24.
7. Cox NH, Management of lower leg cellulitis. Clin Med. 2002:2(1):23-7.
8. Trubo R, Bisno AL, Hacker SM, Roaten SP. Today's strategies for bacterial skin infections. Patient Care. 1997:31:78-94.
9. Eron LJ. Infections of skin and soft tissues: outcome of a classification scheme. Clin Infect Dis. 2000:31:287.
10. Morris A. Cellulitis and erysipelas. Clin Evid. 2003:9:1804-9.
11. Goettsch WG, Bouwes Bavinck JN, Herings RM. Burden of illness of bacterial cellulitis and erysipelas of the leg in the Netherlands. J Eur Acad Dermatol Venereol. 200:20(7):834-9.
12. Lebre C, Girard-Pipau F, Roujeau JC, Revuz J, Saiag P, Chosidow O. Value of fine needle aspiration in infectious cellulitis. Arch Dermatol. 1996:132:842-3.
13. Epperly TD. the value of needle aspiration in the management of cellulitis. J Fam Pract. 1986:23:337-40.

Cite this article as: Deshpande SG, Grover A, Shahapurkar VV, Shinde RK. Limb cellulitis in rural setting in India: a case control study. Int Surg J 2017;4:2751-5.