

Harnessing Filaria for Diabetic Foot Cellulitis: A Unique Case Report

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ABSTRACT

Diabetic foot cellulitis is a chronic complication of diabetes mellitus leading to chronic infections, delayed healing, and in several severe cases, amputation. The conventional treatment with antibiotics may not be very effective and there is an immediate need to explore the alternative treatment approaches for the effective treatment of Diabetic foot cellulitis. The most frequent causative organisms responsible for Diabetic foot cellulitis are Staphylococci, Streptococci and Pseudomonas species. Even though there are several factors predisposed to this infection and are probably operative in the pathogenesis of illness, how these factors predispose patients to Diabetic foot cellulitis is completely not known. Filial infections have been known to modulate host immune responses particularly anti-inflammatory cytokines, like Interleukin-10 which may contribute to controlled immune response and reduced tissue damage. This could suggest a possible interplay between filarial infections and Diabetic foot cellulitis.

Keywords: Diabetic foot cellulitis, Amputation, Causative organisms, Antibiotic therapies, Inflammation, Filaria, Blisters.

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Received: 08-01-2025;

Revised: 24-03-2025;

Accepted: 24-05-2025.

INTRODUCTION

Diabetic Foot Cellulitis

Diabetic foot cellulitis is a serious, soft tissue infection, potentially life-threatening affecting individuals with Diabetic Mellitus.¹⁻³ It is a major complication of diabetes, primarily resulting from prolonged hyperglycemia, peripheral neuropathy, and compromised immune system. This condition can lead to severe outcomes such as chronic ulcers, deep tissue infections, Osteomyelitis, gangrene and even limb amputation, if left untreated (Figure 1). Due to impaired wound healing and increased susceptibility to infections, this diabetic foot cellulitis is a major cause for morbidity and amputation of lower limb worldwide. The development of Diabetic foot cellulitis involves several underlying mechanisms like peripheral neuropathy, hyperglycemia, immune dysfunction, microbial colonization and super infection.⁴⁻⁶ The Diabetic foot cellulitis typically presents with localized redness [erythema and swelling], increased warmth in the affected area, severe pain or tenderness, ulcerations, fever and systemic symptoms.

Diagnosis and management

This Diabetic foot cellulitis is diagnosed through clinical examination, wound cultures, blood tests and imaging studies like X-rays. The doctor may try to draw fluid from the affected area with a needle and the fluid is sent to the laboratory for cultural test. There are different types of treatment options available like antibiotic therapy, where broad spectrum antibiotics are initiated based on culture results, glycemic control, which is essential for infection resolution. Necrotic tissue removal and regular wound dressing, which is a part of wound care, and debridement.^{7,8} The last important management is through surgical intervention where drainage of abscess (or) in extreme cases, amputation to prevent systemic spread.

Filaria

Filarial parasites are responsible for the spectrum of diseases like Filariasis, including Lymphatic Filariasis, Onchocerciasis, affecting millions of population in tropical and subtropical regions. This is characterized by chronic lymphedema, immune dys regulation and bacterial infections.^{9,10} The chronic presence of Filial parasites induces a regulatory immune state which is characterized by up-regulation of interleukin-10, reduced pro-inflammatory responses such as TNF- α and Interferon- γ . Some studies suggest that helminthes can influence gut and skin micro-biota potentially leading to bacterial infections.



DOI: 10.5530/ijopp.20250377

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CASE-STUDY: 1

A 60-year-old male patient was presented to surgery department at GSL Hospital with complaints of leg swelling and discoloration of right foot since 2 days. The patient was known diabetic since 2 years and the history of present illness started with swelling of right foot where swelling is extended up to the knee and is associated with discoloration. The very 1st day of examination there is oozing of fluid from the swollen area of foot with edema and there is a marked raise in temperature. The skin was peeled in few areas and the urinary output was reduced. The laboratory investigations revealed the random blood sugar of 190 mg/dL, Blood Urea Nitrogen (BUN) was 70mg/dL, Serum creatinine was 3 mg/dL and Blood pressure was 130/70mm/Hg with pulse rate 76 beats/minute. Microscopy reveals the presence of pus cells, and both gram-positive and gram-negative bacteria with increased markers of inflammation like C-Reactive Protein [CRP] and Leucocyte count. The patient was diagnosed as cellulites, with right leg filaria. Small vertical incision was done on prominent tissue area and fluid was drained after squeezing of the leg.

Povidone-iodine, ointment was applied regularly and the drug therapy Cefoperazone, which is a Cephalosporin antibiotic and Sulbactam, which is a β -lactamase inhibitor given IV dose 5 g once in a day [o.d], Metronidazole- 400 mg IV thrice a day [t.i.d].

Paracetamol-500 mg thrice daily [t.i.d], Diethyl Carbamazine Citrate-100 mg were given. The patient at the beginning of standard antimicrobial therapy was not responsive, but after treatment with Diethyl Carbamazine Citrate-100 mg reduced inflammation and wound healing. The drug therapy is discussed in Table 1.

CASE-STUDY: 2

A 40-year-old female patient was admitted in the surgical ward with complaints of ulcers on right leg since 3 months, followed by severe swelling and fever since last 1 week. No history of similar complaints in the past were observed. She is known diabetic since 10 years and taking the medications. On physical examination, 1x1 cm ulcer is present, which is granulomatous as shown in Figure 2. Blood pressure was reported as 140/80mm/Hg with pulse rate of 70beats/minute and the random blood sugar is 190 mg/dL, Hemoglobin with 10 g% and Blood urea nitrogen is 30 mg/dL, serum creatinine 1 mg/dL and the blood investigations detected microfilariae. The patient was diagnosed as Diabetic foot cellulitis with Filaria which was confirmed due to the elevated CRP and increased WBC count, with microbial infection revealed during culture tests. The drug therapy of Sodium Cefuroxime IV 1 g 3 times a day [t.i.d]. Metronidazole IV 100 mL thrice daily [t.i.d] and Diethyl Carbamazine Citrate-100 mg thrice a day

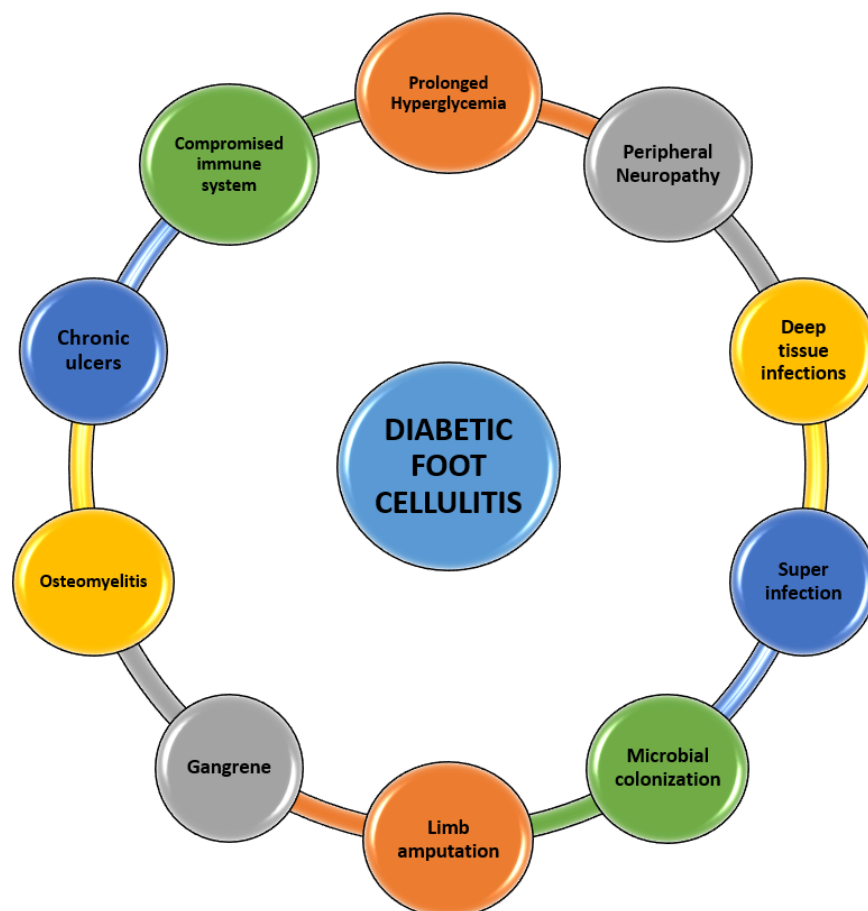


Figure 1: Outcomes of Diabetic Foot Cellulitis.

Table 1: Drug Therapy of Case Study-1.

Drug	Route of Administration	Dose	Frequency
Cefoperazone+Salbactam	IV	1 g	o.d
Metronidazole-400mg	IV	100 mL	t.i.d
Paracetamol	Oral	500 mg	t.i.d
Diethyl carbamazine Citrate	Oral	100 mg	t.i.d
Povidone-iodine ointment	Topical	-	-

Table 2: Drug Therapy of Case Study 2.

Drug	Route of Administration	Dose	Frequency
Sodium Cefuroxime	IV	1 g	t.i.d
Metronidazole-400 mg	IV	100 mL	t.i.d
Diethyl carbamazine Citrate	Oral	100 mg	t.i.d
Cefixime	Oral	200 mg	b.i.d
Tramadol	Oral	50 mg	b.i.d
B-complex, Iron Folic acid	Tablets	-	o.d

**Figure 2:** Diabetic Foot Cellulitis.

[t.i.d.]. In addition, Cefixime tablets 200 mg twice a day [b.i.d] and Tramadol 50 mg twice a day [b.i.d] for a period of 6 days. The drug therapy is discussed in Table 2, along with this drug therapy, additional medical supportive care is also given, which includes B-complex, Iron folic acid for a period of 1 month.

RESULTS

The ideology behind the Diabetic foot cellulitis is a bacterial infection and the most common causes in the developing world is Filaria. In this case study a 60-year-old male patient with 2 years and 40 years female patient with 10 years history of Type-II Diabetes Mellitus were presented to surgery department. The lab investigations confirmed that elevated WBC count and increased CRP value associated with hyperglycemia. The urine culture test revealed polymicrobial infection and in routine blood investigations microfilaria was detected with cellulitis. The condition in both the cases is persistent despite with antibiotic therapy, where patients were advised to take medications along with Cefoperazone, Sulbactam, Metronidazole, Sodium Cefuroxime, Paracetamol, Tramadol. The patients were treated with Diethyl Carbamazine Citrate [DEC] an anti-filarial drug in addition with antibiotic which possess broad spectrum of bacterial coverage. Within 10 days patient showed abnormal reduction in swelling, erythema, pain and after 2 weeks the leukocyte count and CRP levels were normalized and there is significant wound healing with no signs of infection.

DISCUSSION

It is a very well-known fact that filarial parasites are known to possess mild anti-inflammatory effects and induce immune tolerance. The up-regulation of anti-inflammatory cytokines like IL-10 and down-regulation of pro-inflammatory cytokines like IL-6 and TNF- α could have been contributed to reduce inflammation in the diabetic foot by exhibiting accelerated wound healing. The implementation of Diethyl Carbamazine Citrate, markedly reduced the filarial infection which might have modulated the immune response by influencing the immune environment of diabetic food cellulites, thereby reducing the excessive inflammatory response, increasing the anti-microbial synergy, promoting better drug penetration in the infected tissue. The combination of antibiotics with Metronidazole effectively targeted the microbial infection in diabetic food cellulites. The use of tramadol provided pain relief and also reducing stress-induce hyperglycemia which could delay the wound healing process.

During this period of treatment, patients were counseled regarding the disease condition and the treatment pattern. The patients were enquired for any adverse effects, but as such, there are no significant adverse effects reported upon treatment. The combination of antibiotic therapies, with anti-filarial drug subsided the clinical symptoms like severe swelling, erythema and leg warmth within 5 days. All vitals are very stable and supportive medications like Vitamins, Iron supplements were provided for

fast and quick recovery. After the end of the treatment patients felt lot of relief and the doctors advised to continue the medications if necessary.

CONCLUSION

With intense wound care and systemic antibiotics with anti-filarial drug, the patients were recovered completely from all the symptoms within 2 weeks. Physicians and other health care providers should be aware of Diabetic foot cellulitis treatments, otherwise may lead to severe complications like sepsis and amputation. The treatment pattern with antibiotics and anti-filarial drug is a potential link in treating Diabetic foot cellulitis, and more research is required to study the elements induced immune modulation in various chronic infections and inflammatory conclusions.

ACKNOWLEDGEMENT

The management of Aditya College of Pharmacy and GSL Hospital is acknowledged by the authors for providing the required facilities to conduct the research.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

BUN: Blood Urea Nitrogen; **CRP:** C-reactive protein; **BP:** Blood Pressure; **WBC:** White Blood Cells; **Hb:** Hemoglobin; **IL:** Interleukins.

SUMMARY

These 2 case studies explores the unique critical outcomes of diabetic patients presenting with foot cellulitis, initially they were treated with conventional antibiotic therapy of Cefuroxime sodium, Metronidazole, Cefixime, Cefoperazone and Salbactam along with Tramadol to relieve excess pain. Initially limited improvement was observed later the initiation of Diethyl Carbamazine Citrate therapy, the patient exhibited marked reduction in inflammation and showed wound procedure. This significant therapeutic responses promoted the considerations of immune-modulatory effects of this filarial infection and also the treatment of inflammatory conditions in diabetic foot cellulitis. The alarming aspect is the potential synergistic role between antibiotics and anti-filarial drugs racing important queries about the possible interactions between parasitic infections, host immunity and chronic wound healing.

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Cite this article: Shankar KR, Gnaneswari K, Devi ST. Harnessing Filaria for Diabetic Foot Cellulitis-A Unique Case Report. *Indian J Pharmacy Practice*. 2025;18(4):461-5.