

# An unusual cause of foot ulcer in a patient with diabetes mellitus

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## ABSTRACT

A diabetic foot ulcer is the leading cause of nontraumatic amputation worldwide. The most important predisposing factor for diabetic foot ulcer is peripheral neuropathy. Rat bites are an uncommon but important cause of ulcer in patients with diabetes, especially in lower socioeconomic strata. A 56-year-old male from southern India, a known patient with type 2 diabetes for the past 15 years with severe peripheral neuropathy, presented to our center with multiple bite marks on bilateral feet and destroyed nails. He was initially managed with local measures and injection tetanus toxoid; however, he rapidly worsened over the next 5 days to develop bilateral cellulitis of the feet and right great toe osteomyelitis. His biochemistry showed uncontrolled diabetes (HbA1c: 9.9) and radiology confirmed right great toe osteomyelitis. He underwent transmetatarsal amputation of the right first toe along with intravenous antibiotics followed by oral antibiotics (amoxicillin with clavulanic acid) for a total duration of 6 weeks and optimization of glycemic control. He improved completely over the next 1 month. Rat bites are a rare but readily preventable cause of foot ulcer in diabetic patients. Primary care and family physician play a vital role in educating patients about preventive aspects such as avoidance of using vegetable oil as a moisturizer that may attract rodents and insects.

**Keywords:** Diabetic foot ulcer, peripheral neuropathy, rat bite

## Introduction

Diabetes mellitus being a multisystem disease presents with peripheral neuropathy in a large proportion of patients, predisposing to foot ulcers.<sup>[1]</sup> A diabetic foot ulcer is one of the leading causes of nontraumatic amputation worldwide.<sup>[2]</sup> Rat bites form a rare but important preventable cause of diabetic foot ulcer in people of lower socioeconomic strata leading to significant morbidity and mortality.<sup>[3]</sup> Here we present a patient with uncontrolled diabetes mellitus and severe peripheral neuropathy, who presented with rat bite as a cause of diabetic foot ulcer.

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## Case Report

A 56-year-old male referred by his primary care physician for ulcer in both feet of 1-week duration. He had type 2 diabetes mellitus for the past 15 years with bilateral severe distal symmetric peripheral neuropathy as a predominant complication. He was regularly using coconut oil as an emollient on bilateral legs to relieve symptoms of neuropathy (a common practice in southern India especially in lower socioeconomic strata). On the morning of the presentation, he had noticed sudden onset of destroyed nails and multiple rat bite marks on the bilateral toes of the feet with bleeding points [Figure 1]. He was initially managed with local measures and tetanus toxoid injection. The injured site rapidly worsened over the next 5 days with features of cellulitis of the feet and systemic inflammatory response syndrome (fever with chills and rigors), prompting presentation to our center.

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**Figure 1:** Multiple damaged nails and foot ulcers caused by rat bite in a patient with diabetic peripheral neuropathy

His clinical examination revealed stable vital parameters, features of bilateral cellulitis of the feet with right great toe osteomyelitis. Peripheral neuropathy was bilaterally symmetrical and severe as indicated by Semmes Weinstein monofilament (undetectable 10 g) and biothesiometer ( $>40$  v). His biochemistry revealed poorly controlled diabetes mellitus (HbA1C: 9.9), normal renal function (creatinine: 0.7 mg/dL), mildly elevated total leukocyte counts (total count: 9000 cells/mm<sup>3</sup>, hemoglobin: 11.8 gm%), and radiology showing features of osteomyelitis of the terminal phalanx of right great toe. He had been on oral hypoglycemic agents (metformin and glibenclamide) with premixed insulin (30/70) twice a day. The reasons for poor glycemic control were irregular medications, poor insight into the dietary, and physical activity pattern.

He underwent transmetatarsal amputation of the right first toe along with intravenous antibiotics followed by oral antibiotics (amoxicillin with clavulanic acid) for a total duration of 6 weeks, oral hypoglycemic agents and insulin therapy were optimized. He had complete clinical improvement within next 1 month.

## Discussion

Diabetes mellitus is one of the most important causes of peripheral neuropathy worldwide. The prevalence of neuropathy increases with the increased duration of suboptimal glycemic control.<sup>[1,4]</sup> Almost one-fourth of the patients with diabetes are prone to develop foot ulcers. Loss of protective sensation because of neuropathy, prior ulcers, foot deformity leading to trauma, and ischemia are some of the important risk factors causing ulcers.<sup>[5,6]</sup> Rat bites are an uncommon cause of ulcer in neurologically compromised feet.

The primary care and family physicians need to be aware of this potentially preventable foot ulcer secondary to rat bite in subjects with diabetic peripheral neuropathy. Primary care physicians need to educate patients about the preventive measures such as avoidance of using vegetable oil as a moisturizer that may attract rodents and insects.

The predominant age groups are children  $<5$  years with the sites being face and extremities and the bites commonly occurring in the night time.<sup>[3,7]</sup> Diabetic patients with peripheral neuropathy are particularly at increased risk for rat bites, especially in lower socioeconomic strata with a large rat population. Rat bites in subjects with diabetes present with significant morbidity if untreated with progressing infection lower, limb amputation, and even mortality.<sup>[3,8]</sup> In a series from India,<sup>[9]</sup> the patients were all from rural background with prolonged diabetes and the most common site of bite being in the extremities, the presentation being similar to the patient in this case report. The treatment of these bites depends on the severity of the illness. Tetanus toxoid should be administered in all patients with local cleaning measures. Penicillin group of antibiotics are very effective in therapy and surgical management would be needed in case of progressive infection and osteomyelitis.<sup>[9]</sup> There are several theories of the aroma of coconut oil used for local application acting as an attractant for the rats. In our patient, the bite was at night while he was asleep. He underwent transmetatarsal amputation of the right great toe followed by long-duration antibiotics; he had complete resolution of ulcer at follow-up. A high index of suspicion is the key in diagnosis and management of this readily preventable and treatable condition.<sup>[10]</sup> Awareness among primary care physicians about this condition especially in rural Indian setting and also for early referral to a higher center when needed.<sup>[11]</sup> Educating patients plays an important role in preventing the recurrence of this disease.<sup>[12]</sup>

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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