



Rat Bites in the Diabetic Foot: Clinical Clues

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ABSTRACT

BACKGROUND: Ulcers in patients with diabetic neuropathy in their feet are quite common but should be differentiated from the distinctive but rare ulceration resulting from rat bites in these insensate feet. We describe and analyze the features of rat bites in 2 patients with diabetic neuropathy in their feet and highlight 8 clinical features that should raise suspicion and alert the clinician to this possibility.

METHODS: We describe and analyze the features of rat bites in 2 patients with diabetic neuropathy in their feet and highlight the distinctive clinical features of this condition.

RESULTS: The following features were noted: 1) blood on bed sheets on waking; 2) painless, nonsuppurating ulceration; 3) multiple ulcers that are linear, sharp, or with serrated edges; 4) varying depths within the ulcer; 5) sudden onset (was not noted the day before but found in morning); 6) ulcers not contiguous; 7) often bilateral; and 8) the sole of the foot is not involved. Early recognition and prompt treatment resulted in digit and limb salvage.

CONCLUSIONS: We describe and analyze the features of rat bites in 2 patients with diabetic neuropathy in their feet and highlight 8 clinical features that should raise suspicion and alert the clinician to this possibility.

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KEYWORDS: Diabetic peripheral neuropathy; Diabetic ulcers; Rat bites

INTRODUCTION

Although diabetic foot ulcers are quite common, ulceration as a result of a rat bite is very rare in the developed world. We could find only 1 report of diabetic foot ulcer from rat bite in the United States,¹ none from the UK or Canada, and 1 from the Caribbean island of Dominica 30 years ago.² Delay in diagnosis can result in limb loss or even death. We recently encountered 2 cases and highlight 8 features that may lead to early diagnosis and appropriate therapy, thus minimizing treatment delay and complications.

CASE 1

A 65-year-old male, who had been diabetic for 18 years, presented with ulceration of the right hallux and second and third toes (Figure 1). The ulcers were of varying depth with

irregular edges. He noticed blood staining of the bed sheet about 6 days before. On careful inspection, he also had small linear ulcerations on the dorsum of both feet and a small ulcer on the medial side of the opposite foot (Figures 2A and B). The foot was warm and swollen with good pulses. He admitted to having rats at home and, on occasion, chased them off his bed. A diagnosis of foot ulceration as a result of a rat bite was made. He was febrile but not toxic. In view of cellulitis and fever he was admitted, given intravenous amoxicillin/clavulanate, metronidazole, and kept in bed with the leg elevated. He improved and was discharged on oral antibiotics 3 days later.

CASE 2

A 62-year-old male, who had diabetic for 24 years, presented with a 5-day history of painless, 1.5-cm ulceration of the tip of right hallux. He had noticed mild blood staining of his bed sheet 5 days before. Examination of the ulcer and the footwear suggested that trauma was not a likely cause because the ulcer was at the tip of a normal (not hammer) toe, and he wore open-toed sandals and slippers. Closer inspection showed that the edges of the ulcer were serrated, not smooth, which indicated bites by sharp small teeth

Funding: None.

Conflicts of Interest: None.

Authorship: All authors had access to the data and had a role in writing this manuscript.

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(Figure 3). Examination of the adjacent side of the second toe showed a clean linear cut, apparently caused by a small, sharp, cutting edge (Figure 3). The third toe also showed 2 small ulcerating areas, but on the lateral side of the distal phalanx, quite apart from the other 2 toes and unlikely to be caused by the same, single traumatic event. Based on these observations the patient was asked directly about rats at home, and he indicated that he did have a rat infestation problem. He had numbness of both feet for the past 2 years but had normal pulses distally. He was neither febrile nor toxic and was managed as an outpatient with amoxicillin/clavulanate and metronidazole.

DISCUSSION

Although quite rare as a cause of diabetic foot ulceration in the West, a rat bite is not that uncommon in Asia and Africa.³

Rat bites may result in limb loss or death. In the largest series of 34 cases by Abbas et al from Tanzania, 17 patients (50%) had amputations, 4 of them major.⁴ In addition, 4 (12%) died from overwhelming sepsis; all 4 presented late (after 1 week).

Thus, early recognition is important both to minimize morbidity and mortality. In Edo's case from Nigeria, the patient presented with sepsis 2 weeks after the rat bite and

had to spend 42 days in hospital to control sepsis and salvage feet.⁵ Another patient from Nigeria presented after 2 weeks with severe sepsis and spent 49 days in hospital.⁶ In both cases, blood was found on the bedsheet.^{5,6} Both our cases presented within 1 week of injury, but Case 1 had significant ascending and systemic sepsis that warranted hospitalization and intravenous antibiotics for 3 days.

Ulcerations at multiple, apparently unrelated sites should rouse suspicion. This occurred in both our cases and is emphasized by Kalra and Marshall.^{3,7} The "serrated" edge of the ulcer (from nibbling), which was very evident in Case 2, is probably the most pathognomonic finding and has been reported once before.⁸ Jariel et al reported a case that also demonstrated varying depth of the ulcer, whereas a pressure ulcer of neuropathy usually has a smooth edge and a flat base.⁸ Also, fine, narrow, linear ulcerations (obvious in Figure 3A) are indicative of teeth marks and should suggest the diagnosis. The lesions are usually multiple, small (less than 1 cm), and may occur on non-adjacent parts of the foot.³ The pictures published by Shah et al

demonstrate these linear ulcerations well.¹ Whereas the sole of the foot is the classical site for pressure ulcers or puncture wounds, in both our cases the soles were spared. We believe this to be a distinctive feature of rat bites.

CLINICAL SIGNIFICANCE

- Rat bites may go unrecognized in patients with diabetic neuropathy in their feet and be mistaken for more typical traumatic ulcers.
- Clinical features that should alert the clinician to this uncommon but potentially dangerous condition include:
 - Blood on bed sheets on waking
 - Painless, nonsuppurating ulceration
 - Multiple ulcers that are linear, sharp, or with serrated edges
 - Varying depths within the ulcer
 - Sudden onset
 - Noncontiguous ulcers
 - Often bilateral
 - Sole of the foot is not involved



Figure 1 An ulceration of the right hallux and second and third toes with serrated edges and varying depths within each ulcer.

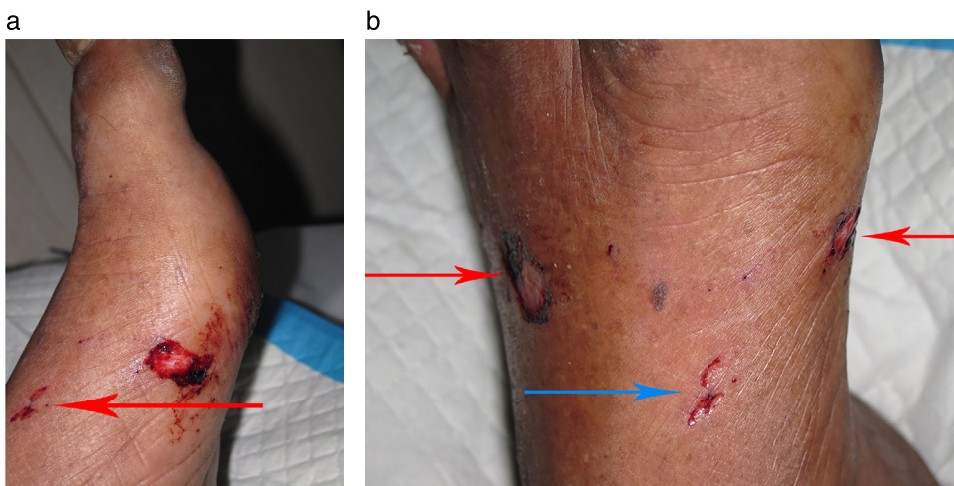


Figure 2 (A) Small linear ulcers (red arrow) and a small ulcer on the medial side of the left foot. (B) Linear ulcers on dorsum right foot (blue arrow), caused by small, sharp teeth with 2 other noncontiguous ulcers (red arrowheads).

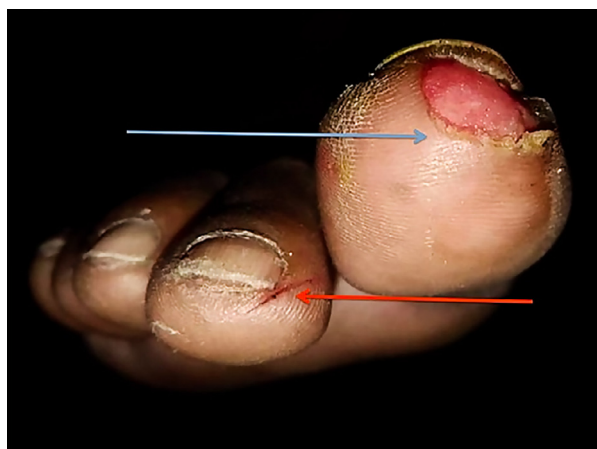


Figure 3 The serrated edges of wound (blue arrow) and a clean linear cut (red arrow).

However, there is a single case reported by Kalra, but it is not clear whether that was a previous plantar ulcer that was bitten into by rats.³

Because this is generally an uncommon condition, we wish to emphasize the following features that could alert

the clinician to this diagnosis: 1) blood on bed sheets on waking; 2) painless, nonsuppurating ulceration; 3) multiple ulcers that are linear, sharp, or with serrated edges; 4) varying depths within the ulcer; 5) of sudden onset (was not noted the day before but found in morning); 6) ulcers not contiguous; 7) often bilateral; and 8) the sole of the foot is rarely involved. Early diagnosis and prompt treatment should decrease morbidity and mortality.

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