

Diabetic foot ulcer following a rat bite: A case report

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Abstract

Diabetic foot ulcers are associated with significant morbidity and mortality in individuals living with diabetes mellitus. It is also a leading cause of non-traumatic amputation worldwide. The most important predisposing factor for diabetic foot ulcer is peripheral neuropathy. Precedent events leading to diabetic foot ulcers include trauma, wearing of tight, fitting shoes and burns. Rat bites are an uncommon but important cause of ulcer in patients living with diabetes, especially in low socio-economic strata like Nigeria. The patient living with diabetes described here was from a rural setting and presented to us with foot ulcers secondary to rat bites. Rat bites are a very preventable

cause/predisposing factor for foot ulcers and patients need to be more enlightened on measures to reduce the occurrence of foot ulcers as a result of rat bites and in addition, a good knowledge of daily foot examination by the patient.

Keywords: Diabetic foot ulcer; Peripheral neuropathy; Rat bite

Introduction

Diabetes mellitus, being a multisystemic disease presents with peripheral neuropathy in a large population of patients, predisposing to foot ulcers.¹⁻⁷

Rat bite is an uncommon cause of foot ulcer in persons living with diabetes. It can be fatal and may be associated with rat bite fever, tetanus and rabies.^{8,-11}

Atherosclerosis and peripheral neuropathy are underlying mechanisms associated with the occurrence of diabetic foot ulcers.¹² People with diabetes mellitus have a higher incidence of atherosclerosis, thickening of capillary basement membrane, arterial hyalinosis and endothelial proliferation.¹²

Other factors that increase the likelihood of peripheral artery disease include smoking, hypertension, high blood cholesterol levels, being overweight, sedentary lifestyle, previous or existing history of heart disease.

The pathophysiology of diabetic foot ulcers has neuro-pathic, vascular and immune system components, which all show a base relationship with the hyperglycemic state of diabetes.¹³⁻¹⁴

Hyperglycemia produces oxidative stress on nerve cells

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and leads to neuropathy.¹³

Patients do not notice foot wounds because of decreased peripheral sensation like in our patient.

Peripheral neuropathy combined with poor arterial flow confers a high risk of limb loss on patients living with diabetes.

A history of traumatic, painless, non-smelling ulcers in a setting of severe neuropathy, poor glycemic control and rural residence may lead one to suspect rat bite as a cause of diabetic ulcers. Here, we report a case of foot ulcer caused by rat bite on background of diabetes mellitus and peripheral neuropathy.

Case Report

A 65 year old male pastor who presented on account of right foot ulcer of 3 weeks duration. He had type 2 diabetes mellitus for the past 15 years with bilateral peripheral neuropathy as a complication. He takes Metformin 500 mg daily and was said to be compliant with his medications. On the day of presentation, he noticed rat bite marks on his right fifth toe, which he noted not after the bite but when the site started bleeding. The ulcer was been dressed regularly at a peripheral hospital but did not show much improvement. There was no history of fever but there was positive history of numbness of legs and tingling sensation on the upper limbs. He was not a known hypertensive (Table 1).

Test	Results
Creatinine	1.1mg/dl
Urea	22mg/dl
Sodium	142mmol/L
Potassium	3.8mmol/L
Bicarbonate	24mmol/L
Chloride	101mmol/L

Table 1: Kidney Function Test

His random blood glucose on admission was 417 mg/dl. He claimed that insulin makes him more forgetful than usual so has not been on insulin since he was diagnosed of diabetes.

His clinical examination revealed stable vital parameters, gangrenous 5th toe of the right foot with surrounding hyperpigmented skin, and absent dorsalis pedis bilaterally. Neurological examination showed that light touch and joint sense were intact.

Investigations requested showed mild anaemia, neutro-

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philic leucocytosis, proteinuria and dyslipidaemia. Glycated haemoglobin was deranged, 8.7% and wound swab culture isolated significant growth of mixed organisms, *Staph aureus* and *Klebsiella*.

He was treated with insulin, metformin, ceftriaxone, tinidazole, dabigatran, vitamin supplements and rosuvastatin.

He was also given intramuscular tetanus toxoid and the wound was dressed daily with normal saline and povidone iodine. The orthopaedic team was invited to review and they counselled patient on the relevance of an ablative surgery which he refused. Patient continued to make noteworthy recovery but was yet to carry out requested investigations due to some financial constraint (Table 2).

Test	Results
Hb	10.5g/dl
PCV	31%
WBC	13.0 x 10 ⁹ /L
Neutrophils	85%
Lymphocytes	12%
Platelet	280 x 10 ⁹ /L

Table 2: Complete Blood Count

Discussion

Rat bites primarily affect children aged 5 years and below who lack the ability to respond to the pain sensation caused by the bite. However, adults are not immune to rat bites.

The prevalence of neuropathy increases with increased duration of sub-optimal glycemic control. Patients living with diabetes that have peripheral neuropathy are more prone to risk of rat bites especially in environment with poor sanitation and large rat population. Rat bites in subjects with diabetes present with significant morbidity with progressing infection, limb amputation and even mortality (Table 3).^{15,16}

Test	Results
Total cholesterol	270mg/dl
Triglycerides	140mg/dl
HDL	40mg/dl
LDL	180mg/dl

Table 3: Fasting Lipid Profile

In a series from India, the patients were all from rural backgrounds 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 who lived in a rural setting (Ahiazu Mbaise, Imo State). There was also a case report of diabetes foot ulcer following a rat bite published in December 2013 by the department of medicine, Federal Medical Centre, Umuahia Abia State shar-

ing some predisposing factors to the rat bite in our patient which includes: rural setting, peripheral neuropathy and poor glycemic control.

In Nigeria, cases of rat bites and diabetic foot are scarcely reported, may be due to the facts that it occurs during their sleep and patient may not realize that they were bitten.

In this index patient, the bite marks were very distinct. Most of these patients present late to the hospitals because of the ideology that these marks might have been spiritual attacks, so they tend to spend more time seeking spiritual help than medical help especially within rural areas.

This was not the case in our index patient because the marks were distinct to rat bite marks even though that may not be enough to convince all patients with the same issue that this is not a spiritual issue.

Conclusion

Diabetic patients need to keep their houses and environments free of rodents, and they should cover their feet while sleeping, for example wearing loose fitting socks.

Rat bite preventive strategies should be included in diabetic foot care education in areas such as ours.

Acknowledgment

None

Conflicts of Interest

The author declares that there are no conflicts of interest.

References

1. Benbow S, Gill G. Diabetic foot Ulceration in developed and developing countries. *Int Diab Dig*; 1998;8:8-10
2. Dagogo-Jacks. Pattern of diabetic foot ulcers in Port-Harcourt, Nigeria. *Pract Diab Digest*; 1991;2:75-80
3. Boulton AJM. The diabetic foot: a major problem for the new millennium. *Int Diab Monitor*; 2001;13:1-4
4. Moses S.E., Klein BE. The Prevalence and incidence of Lower extremity amputation in a diabetic population. *Arch Intern Med*; 1992;152:610-16
5. Eregie A, Edo A.E. Factors associated with diabetic foot ulcers in Benin City, Nigeria. *Niger Med J* 2008;49:9-11.
6. Hirschhorn R.B, Hodege R.R. Identification of Risk factors in rat bite incidents involving humans. *Paediatrics*; 1999;104:35.
7. Davies M. Brophy S., Williams R., Taylor A. The Prevalence, Severity and Impact of Painful Diabetic Peripheral neuropathy in Type 2 Diabetes. *Diabetes care*; 2006;29:1518-22.

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8. Yanai O, Goldin L., Hiss J. Fata rat bites, Harefuah; 1999; 136:611-613.
9. Hudsmith L., Weston V., Seram J. Clinical Picture, Rat bite fever, Lancet, Infect Dis; 2001;1:91.
10. Mathiasen T, Rix M. Rat bite: An infant bitten by a rat. Uresh Laeger. 1993;155:1475-1476.
11. Marshal J, Sharp E, Barrison I.G. Once bitten, twice Shy; BMJ 1994;309:1694-1695
12. Vincent LR. Diabetic Foot Ulcers. Int Diab Monitor. 1998;54:122-125
13. Clayton W. jr, Elasy. T.A. A review of the pathophysiology, classification, and treatment of foot ulcers in diabetic patients. Clinical Diabetes; 2009;27(2):52-58.
14. Wolf G. New insights into the pathophysiology of diabetic nephropathy: from haemodynamics to molecular pathology. Eur JCLM invest; 2004, 34(12):785-796
15. Abbas Z.G. Lutale J, Archibald L.K. Rodent Bites on the feet of diabetes patients in Tanzania. Diabet Med; 2008;22:631-633.
16. Tiwari, S., Pratyush D.D., Dwivedi A, Gupta Sk, et al. Microbiological and Clinical characteristics of diabetic foot infections in northern India. J infect Dev Cities; 2012;6:329-32.
17. Kalra B, Kalra S, Chatley G, Singh H. Rat bite as a cause of diabetic foot ulcer. A series of eight cases. Diabetologia; 2006;49:1452-3.