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Abstract

It is well recognised that septic sequelae of puncture wounds are worse in diabetics. Since much of the spreading foot sepsis from puncture wounds is deep to the deep fascia, and because the sole of the foot has thick skin and subcutaneous fibrous septae, crepitus is not as easily appreciated as it is at other sites. Also the rubor of the inflammatory response is minimal in subfascial sepsis and it is therefore easy to underestimate the extent of deep gangrene. The absence of pain due to neuropathy also masks the inflammatory reaction and makes a foreign body or severe osteomyelitis less obvious clinically. These cases demonstrate the value of routine and early radiographs in the assessment of puncture wounds in diabetic feet.

Keywords

puncture wounds, foreign body, radiographs, diabetic foot

Sepsis is a common cause of diabetic lower limb amputation in the developing world.¹⁻³ Even in developed countries it is a significant contributor to limb loss.⁴ A puncture wound is often the initiating event in foot sepsis.⁵ However, difficulties in the diagnosis and management of the puncture wound may lead to misdiagnosis and inappropriate treatment. Although in many settings, the plain X-ray is not routinely done for these injuries, we have found it to be very useful for several reasons as demonstrated by the following cases.

Case 1

A 38-year-old male diabetic for 15 years had sustained a puncture wound on the sole of the foot 4 weeks previously. While gardening, a nail pierced his shoe and injured his plantar skin opposite the third metatarso-phalangeal joint. Two days later, he observed some swelling at the site, visited his general practitioner, and was given a 1-week course of amoxicillin and clavulanic acid. Two weeks after the injury, he found that the area looked erythematous and was given another course of antibiotics by the general practitioner. On seeing no improvement, he visited hospital 4 weeks after the initial injury. On admission, he gave a history of having fever “off and on” over the previous week. The foot was warm, mildly swollen, nontender, and erythematous with normal pulses. A puncture wound, oozing a bead of pus, was evident on the plantar surface near the third metatarso-phalangeal joint. X-ray showed osteomyelitis involving the

third metatarsal head (see Figure 1). Debridement involved excision of the infected bone and adjacent gangrenous tissue from sole to dorsum (see Figure 2). The area was healing after 4 weeks (see Figure 3).

Case 2

A 55-year-old male diabetic for 11 years sustained a puncture wound to the foot while working in his yard. He did not feel pain but noticed blood on his foot as he was wearing a slipper. He cleaned it and applied a dressing. Over the following 3 days, the foot became swollen and warm. He then visited the general practitioner. He was treated with amoxicillin/clavulanic acid. The sepsis persisted and he presented to hospital 2 weeks later. By this time, the puncture site was barely identifiable but the surrounding area was swollen and erythematous (see Figure 4). X-ray showed a foreign body in the foot (see Figure 5). At surgery, the foreign body was removed and debridement of the foot done. The foot healed after 4 weeks of daily dressing as an outpatient.

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Figure 1. Osteomyelitis involving the third metatarsal head (arrow)



Figure 3. Good healing after 4 weeks



Figure 4. Site of puncture wound (arrow) and distal erythema

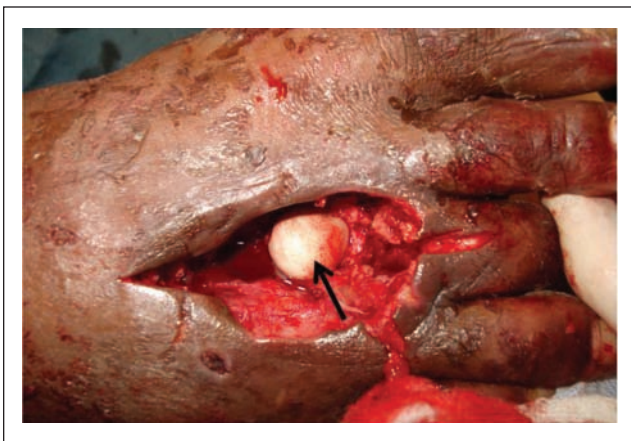


Figure 2. All gangrenous bone and tissue from sole to dorsum excised. Surgeon's finger (arrow) showing full thickness defect



Figure 5. Foreign body evident 4 weeks after persisting sepsis

Case 3

A 62-year-old male diabetic of 8 years sustained a puncture wound in the sole of the foot near the third metatarsophalangeal joint. He ignored the injury as it was not painful. Five

days later, he noticed swelling with some discoloration at the site and presented to hospital. On examination, the area



Figure 6. Air in soft tissue (arrows), far more extensive than clinically evident

was swollen, erythematous, and warm. The foot pulses were excellent; no crepitus was detected on palpitation. However, X-ray showed air in the tissues in an area more extensive than was evident on clinical examination of the foot (see Figure 6). Generous debridement resulted in complete healing.

Discussion

Puncture wounds are not only a common cause of diabetic foot sepsis, these may also be the initiating event leading to lower limb amputation in a patient with diabetes.⁵ Clear guidelines on the management of puncture wounds in the diabetic foot are very limited. Rubin et al⁶ advocated use of ultrasound to locate nonopaque foreign bodies if the puncture occurred through rubber footwear. They were able to identify foreign bodies in 25% of cases.⁶ X-rays are not routinely done in most cases of such injuries but, as seen in our 3 cases, they could be of immense value. If a puncture wound is suspected either on history or on examination, an X-ray could be of value in identifying an opaque foreign body. If none is found, this investigation could serve as a baseline in observing later bony changes or spreading sepsis by gas-forming organisms. In none of our 3 cases was there a baseline study to assist in assessing deterioration although all had worsening sepsis in spite of antibiotic and topical treatments. It is well recognized that septic sequelae of puncture wounds are worse in diabetics. They more commonly have delayed treatment, osteomyelitis, and amputation.^{5,7} We feel that in the presence of persistent or worsening sepsis, a plain X-ray could be very valuable as it might identify the foreign body or bony changes as the cause of

persistent sepsis or show tissue gas indicating the extent of sepsis and the likely organisms involved. Since much of the spreading foot sepsis from puncture wounds is deep to the deep fascia, crepitus is not easily appreciated even when obvious gas is seen on X-ray as in our third case. Also in the sole of the foot with its thick skin and subcutaneous fibrous septae, crepitus is not as easily appreciated as it is at other sites. Also the rubor of the inflammatory response is minimal in subfascial sepsis and it is therefore easy to underestimate the extent of deep gangrene. The absence of pain due to neuropathy also masks the inflammatory reaction and makes a foreign body or severe osteomyelitis less obvious clinically. For these reasons, we recommend that X-rays be used early in the assessment of puncture wounds in diabetic feet, and they should be routinely done for evaluating persistent or worsening sepsis.

Declaration of Conflicting Interests

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