FACTSHEET 2:

RECOGNISING INFECTION IN DIABETIC FOOT ULCERS

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What is a diabetic foot ulcer?

The International Working Group on the Diabetic Foot (IWGDF) defines a Diabetic Foot Ulcer (DFU) as an ulceration of the foot occurring in a person with current or previously diagnosed diabetes mellitus, typically associated with peripheral neuropathy and/or peripheral arterial disease in the lower extremities (1). While DFU prevalence varies across different regions of the world, it is widely accepted that the lifetime incidence among individuals with diabetes ranges from 19% to 34% globally (2).

One of the most serious complications of DFU is infection, which affects approximately 60% of cases. In around 50% of these, infection is accompanied by ischemia. Due to their typical location near bony prominences or beneath foot deformities, 30% to 40% of diabetic foot infections involve bone, leading to Diabetic Foot Osteomyelitis (DFO) (3).

Diabetic foot ulcer colonisation and diabetic foot infections

Bacterial colonisation of foot ulcers is a constant and expected phenomenon, characterised by the presence of microorganisms on the wound surface without evidence of tissue invasion.

In contrast, wound infection is a pathological condition caused by the invasion and proliferation of microorganisms within host tissues, triggering an inflammatory response that often results in tissue damage. Since all chronic wounds are colonised (frequently by potentially pathogenic microorganisms) the diagnosis of infection cannot rely solely on the results of wound cultures.

Risk of developing a diabetic foot infection

Several factors may predispose a diabetic foot ulcer (DFU) to become infected, including (4):

- a positive probe-to-bone test,
- ulcer duration longer than 30 days,
- history of previous ulceration or amputation,
- traumatic aetiology,
- presence of peripheral arterial disease,
- loss of protective sensation,
- poor metabolic control,
- diabetes-related immune dysfunction.

Diagnosis of diabetic foot ulcer infection

The diagnosis of diabetic foot infection (DFI) is based on the presence of local and/or systemic signs and symptoms of inflammation (3).

A diabetic foot ulcer is considered infected when at least two of the following criteria are present:

- local swelling or induration,
- erythema extending >0.5 cm but <2 cm around the wound
- local tenderness or pain
- increased local temperature
- purulent discharge.

RECOGNISING INFECTION IN DIABETIC FOOT ULCERS

Following the diagnosis of a diabetic foot infection (DFI), it is essential to classify its severity according to the IWGDF/IDSA (3) guidelines to guide antibiotic selection and determine the appropriate setting for management, including the need for hospitalisation or emergency surgical intervention.

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Figure 1. DFU showing moderate infection due to an interdigital ulcer

Diagnosis of diabetic foot osteomyelitis

Osteomyelitis can underlie any foot ulcer, particularly those of long duration or with specific high-risk characteristics such as being extensive, deep, situated over a bony prominence, showing visible bone, or associated with a red, swollen ‘sausage-like’ toe (5).

RECOGNISING INFECTION IN DIABETIC FOOT ULCERS

Figure 2. Sausage toe in a patient with DFO at the distal phalanx of the second toe.

When diabetic foot osteomyelitis (DFO) is suspected, diagnosis should be based on a combination of a positive probe-to-bone (PTB) test, plain radiographs, and inflammatory markers such as erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), or procalcitonin (3).

If the diagnosis of DFO remains uncertain despite clinical assessment, plain X-rays, and laboratory results, magnetic resonance imaging (MRI) is recommended to further evaluate the extent and presence of bone infection (3).

DFU at risk of infection - clinical presentation

There is limited evidence regarding the clinical features of DFUs at risk of infection. However, beyond the accumulation of previously described risk factors, it is widely accepted that a DFU which worsens or deteriorates despite appropriate standard of care should be considered at risk of infection.

A DFU may be considered at risk of infection when the following features are present:

- pale wound bed,
- hypergranulation or unhealthy granulation tissue,
- increased exudate and perilesional maceration,
- friable tissue,
- thickened or undermined wound edges,
- presence of tunnelling or fistulous tracts,
- exposure of bone, joint, or tendon.

RECOGNISING INFECTION IN DIABETIC FOOT ULCERS

Figure 3. DFU at risk of infection showing perilesional maceration, pale wound bed with friable granulation tissue, thickened edges and fistulous track.

Close monitoring of these patients, including imaging studies and assessment of inflammatory markers, is highly recommended in such cases. In these cases, the implementation of anti-biofilm strategies and strict wound hygiene protocols is strongly recommended to prevent the development of diabetic foot infection (DFI).

DFU culturing

A sample for culture should be taken only if a diagnosis of clinically infected DFU is made. Routine or repeated cultures of colonised DFUs may lead to overdiagnosis of diabetic foot infection and contribute to the inappropriate use of antibiotics, potentially resulting in the emergence of multidrug-resistant organisms at the wound site (3).
When infection is suspected, it is recommended to obtain a sample for culture to identify the causative pathogens, ideally by aseptically collecting a tissue specimen (via curettage or biopsy) from the base of the wound. If bone involvement is suspected, the sample should include bone tissue, obtained either intraoperatively or percutaneously (3).

Conventional culture methods are preferred over molecular microbiological techniques for the initial identification of pathogens from soft tissue or bone samples in patients with DFU (3).

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