

Diabetes & Foot Ulceration

Introduction?

Diabetes mellitus (DM) is a global pandemic; in 2015, there was an estimated 415 million adults living with diabetes, approximately 5% of the world population. By 2040 this figure is projected to grow by >50% such that 642 million adults, 7.5% of the world population, will be afflicted. The prevalence of DM in the United Kingdom is currently 6% i.e. 6% of the population are affected. To put that into perspective the prevalence of DM is nearly 4 times higher than all cancers combined and is still rising: it is estimated that by 2025 there will be 5-6 million people living with DM in the UK.

The increasing prevalence of DM has resulted in a dramatic increase in diabetes-related complications. Arterial disease is the principal causes of complications with a 4x increase in the lifetime risk of developing coronary (heart), cerebrovascular (brain) and peripheral artery disease (PAD), with disease severity and rates of progression greater than in individuals without DM. The single commonest cause for hospitalisation in patients with DM is foot ulceration for which PAD is an independent risk factor being present in 50% of cases. The lifetime risk of DM related foot ulceration may be as high as 25% and its occurrence increases the risk of subsequent major lower limb amputation: 5% of individuals undergo an amputation within 1 year of developing a foot ulcer. The lack of adequate blood supply contributes to the need for amputation in up to 90% of patients. It is thus vitally important for all patients with DM and Foot Ulceration to be appropriately assessed and treated for PAD in order to reduce the risk of subsequent amputation.

What is Diabetes Foot Ulceration?

Foot ulceration is a common complication of diabetes and refers to a patch of broken down skin exposing the layers below. They are most common under the big toe, outer aspect of your little toe, heel and tips of your toes.

Is Diabetes Foot Ulceration Common?

Yes, it is a common complication of Diabetes; the incidence of diabetic foot ulceration in the USA and Western Europe is 2-6% with a lifetime risk and recurrence rate of 10-25% and 25%, respectively.

Why is Diabetic Foot Ulceration Important?

Ignored or inadequately treated these ulcers are usually the first step to lower limb amputation with 5% of patients undergoing an amputation within one year of DFU onset and 80% of all amputations in diabetics being preceded by DFU.

What causes Diabetes Foot Ulceration?

Diabetic foot ulceration is caused by abnormal weight loading through the foot and impaired tissue blood perfusion secondary to the combined effects of ischaemia (lack of blood supply) and peripheral neuropathy (nerve damage) and infection.

Why do patients with Diabetes develop ischaemia of the leg or foot?

Peripheral arterial disease is common in patients with diabetes classically causing narrowing or blockages in the arteries of the calf thereby reducing the blood flow into the foot. This is furthermore impaired by the simultaneously deleteriously effects DM has on the microscopic blood vessels –microvascular system- in the foot. Thus, DM affects both large arteries –macrovascular- and very small arteries –microvascular- rendering the circulatory requirements for healing being finely balanced. This alone has considerable implications on treatment strategies and early recognition of arterial disease is vitally important to prevent subsequent amputations.

What is peripheral neuropathy and why does it cause foot ulceration?

Peripheral neuropathy refers to malfunctioning of the nerves that control touch, movement, and automated functions e.g. sweating. Individuals with diabetes typically suffer a gradual onset that affects their feet and progresses up the leg in a symmetrical fashion. Typically, individuals notice of numbness and pins and needles affecting the feet that may progress to burning type pain. The numbness renders these individuals at high risk of injury often from relatively innocuous cause, e.g. a stone in their shoe, as they are devoid of the protective pain reflexes. (see fig. 1a) As the neuropathy progresses it may affect the bones and joints leading to repetitive joint injury and even bony fractures with the foot. (see fig. 1b) Nerve supply to the muscles of the foot may also be impaired causing an imbalance between muscle groups leading to a change in the shape of the foot making it more susceptible to injury. Neuropathy and ischaemia often occur together (neuroischaemia) to initiate the development of a foot ulcer.



Fig 1: a) Early neuroischaemic foot ulcer, b) Gross disruption of foot joints due to neuropathy -Charcot's arthropathy



Fig 1: b) Gross disruption of foot joints due to neuropathy -Charcot's arthropathy

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What role does infection play in Diabetic Foot Ulceration?

More than half of all foot ulcers will become infected and often require hospitalization. Infection may be initially be limited to the ulcer and surrounding skin. However, it is the ability of bacteria to spread quickly into deeper tissue planes including tendons and muscles that leads to 20% of all individuals with a n infected diabetic foot ulceration ultimately undergoing amputation. (See figure 2) Thus, the prompt recognition and treatment of diabetic foot infection is vital to prevent subsequent amputation



Fig. 2 : Infected Diabetic Foot Ulcer

What investigations should be performed for Diabetic Foot Ulceration?

During your review, your surgeon will aim to identify and delineate the presence of ischaemia, neuropathy and infection utilising a combination of clinical assessment (symptoms review and examination) and specialized investigations.

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A combination of the following tests may be recommended depending on your clinical presentation:

- Blood analysis to check for anaemia, kidney function, cholesterol levels
- Diabetes control assessment e.g. Hb1Ac
- Microbiological swab of ulcer
- Ankle brachial pressure index (ABPI) assessment
- Toe pressure assessment
- Electrocardiogram (ECG)



- Duplex Doppler ultrasound scan
- Foot x-ray
- CT angiogram
- MRI of the foot
- MR angiogram

Diabetes represents a multi-morbidity chronic condition with clients with diabetes and aged >65 years being affected by an average of six other conditions including coronary artery disease, stroke and hypertension. For these clients, we may also recommend seeking a second opinion from another medical specialty to ensure we are addressing and optimising all your medical complaints.

What are the treatments for Diabetic Foot Ulceration?

The treatments for diabetic foot ulceration are aimed at:

- a) Improving blood flow to the ulcer e.g. angioplasty or bypass,
- b) Preventing further trauma to the ulcer area e.g. pressure offloading footwear,
- c) Aggressively treating infection e.g. antibiotics or wound debridement.

Occasionally diabetic foot ulceration leads to amputation despite the best efforts of the medical profession. At the Circulation Clinic, we aim to minimize your risk of amputation through a timely and multidisciplinary approach to diabetic foot ulcer care. We work closely with orthopaedic surgeons, diabetologists, interventional radiologists to ensure you receive the best and most appropriate care available.

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