



DIABETIC FOOT ULCER: THE BASICS

- THERE ARE **463 MILLION PEOPLE** WITH DIABETES WORLDWIDE.¹
- **1 IN 4 PATIENTS** WITH DIABETES WILL POTENTIALLY DEVELOP A FOOT ULCER.²
- A FOOT ULCER LEFT OPEN FOR MORE THAN 30 DAYS IS **4X MORE** LIKELY TO GET INFECTED³
- DIABETES HAS BECOME THE **N#1 CAUSE** OF LOWER LIMB AMPUTATIONS⁴
- EVERY **20 SECONDS** A LOWER LIMB IS AMPUTATED DUE TO DIABETES⁵

ABOUT DIABETIC FOOT COMPLICATIONS

Diabetic foot ulcer is one of the most common, costly and severe complications of diabetes.

There are several factors that lead to diabetic foot ulceration and low likelihood of ulcer healing:

Loss of Protective Sensation (LOPS)

Diabetes can present LOPS due to lower limb peripheral neuropathy. Neuropathy is the damage of the nerves due to chronic hyperglycemia. When peripheral neuropathy appears (which is the most common form of diabetic neuropathy), the damage to peripheral nerves may impair sensation, movement, gland or organ function depending on which nerves are affected. Loss of Protective Sensation (LOPS) makes the foot susceptible to trauma or injuries without being noticeable, leading to foot ulceration. Patients with LOPS can lose their normal ability to perceive pain, heat or cold on their feet. When proprioception is reduced, patients become unaware of position of their foot when walking, which can cause significant stresses on their bones and joints. As a result, the foot can respond by growing hard skin (callus), which may lead to foot deformities (Charcot foot) and ulceration.

FOOT DEFORMITIES

For a patient with diabetes, foot complications are an ever-present risk. This risk further increases if you have foot deformities. Damage to the nerve supply of foot muscles causes weakening of the muscles and a change in shape of the feet. This creates abnormal pressure points and bony prominence which can cause sores and ulceration. The most common foot deformation in diabetes are: hammer toe, claw toe, hallux valgus,...

Peripheral arterial disease (PAD)

PAD is associated with diabetes (macroangiopathy and microangiopathy) and can be worsened by smoking, high blood pressure and hypercholesterolemia. Diabetes is one of the major risk factors for atherosclerosis, as it promotes the deposition of cholesterol on the walls of the arteries of the lower limbs, and contributes to the formation of atheroma plaque. Plaque is made up of fat, cholesterol, calcium, and other substances found in the blood. The narrowing of arteries limits the flow of oxygen-rich blood to parts of the body. The classic symptom of PAD is leg pain when walking which resolves with rest, known as intermittent claudication which could lead to a permanent pain. In individuals with severe PAD, complications may arise, including critical limb ischaemia and gangrene. Critical limb ischaemia occurs when the obstruction to blood flow in the artery is compromised to the point where the blood is unable to maintain oxygenation of tissue at rest. In case of neuropathic or traumatic injury, ischaemia will aggravate the situation because of the reduction of oxygenation - and the healing process may be delayed or even impossible.

Previous history of foot ulceration or amputation

After successful healing, the recurrence rates of diabetic foot ulcers are 40% within a year and 65% within 3 years.*

“ Thus, it may be more useful to think of patients who have achieved wound closure as being in remission rather than being healed³

*Armstrong DG, Boulton AJM, Bus SA. Diabetic Foot Ulcers and Their Recurrence. N. Engl J Med. 2017 Jun 15;376(24):2367-2375

TYPES OF DIABETIC FOOT^{6,7}

There are 3 different types of diabetic foot ulcers depending on the presence of neuropathy (LOPS) and ischaemia (PAD)

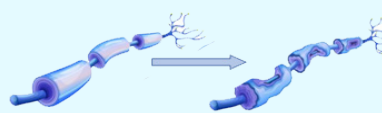
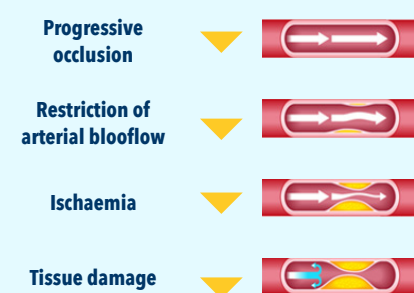
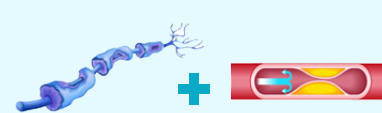



Neuropathic diabetic foot ulcer	Ischaemic diabetic foot ulcer	Neuro-ischaemic diabetic foot ulcer
 <p>Damaged nerves in the lower limbs: Motor, Sensitive and/or Autonomic</p> <p>Loss of sensation Foot deformity Dryness</p> <p>Dryness, Hyperkeratosis, Pressure peaks</p> <p>Ulceration 35% OF PATIENTS ARE NEUROPATHIC ONLY</p>	 <p>Progressive occlusion</p> <p>Restriction of arterial blood flow</p> <p>Ischaemia</p> <p>Tissue damage</p> <p>Ulceration 15% OF PATIENTS ARE ISCHAEMIC ONLY</p>	 <p>Both nerves function and arterial supply are impaired</p> <p>Ulceration 50% OF PATIENTS ARE NEURO-ISCHAEMIC</p>
		
<p>NEUROPATHIC FOOT ULCER</p> <ul style="list-style-type: none"> Etiology: damaged nerves Wound bed: pink and granulating Location: weight bearing areas (metatarsal heads, heel, over the dorsum - claw toes) Sensory loss Callus present and often thick Dry skin and fissuring (cracks) Hyperkeratosis Foot deformities Foot warm with bounding pulses 	<p>ISCHAEMIC FOOT ULCER</p> <ul style="list-style-type: none"> Etiology: restriction of arterial blood flow Painful Necrosis common Foot cold without pulses Wound bed: pale and sloughy with poor granulation tissue Location: tips of toes, nail edges, between the toes and lateral borders of the foot 	<p>NEURO-ISCHAEMIC FOOT ULCER</p> <ul style="list-style-type: none"> Etiology: both nerves function and arterial supply Degree of sensory loss Variable callus Prone to necrosis Foot cold without pulses (potentially) Wound bed: poor granulation tissue High risk of infection Location: margins of the foot and toes, everywhere on the foot

Table 1 Typical features of DFUs according to aetiology

Feature	Neuropathic	Ischaemic	Neuro-ischaemic
Sensation	Sensory loss	Painful	Degree of sensory loss
Callus/necrosis	Callus present and often thick	Necrosis common	Minimal callus Prone to necrosis
Wound bed	Pink and granulating, surrounded by callus	Pale and sloughy with poor granulation	Poor granulation
Foot temperature and pulses	Warm with bounding pulses	Cool with absent pulses	Cool with absent pulses (potentially)
Other	Dry skin and fissuring	Delayed healing	High risk of infection
Typical location	Weight-bearing areas of the foot, such as metatarsal heads, the heel and over the dorsum of clawed toes	Tips of toes, nail edges, between the toes and lateral borders of the foot	Margins of the foot and toes
Prevalence	35%	15%	50%



¹ International Diabetes Federation Atlas – 9th edition 2019: page 34.

² Setacci C, de Donato G, Setacci F, Chisci E. Diabetic patients: epidemiology and global impact. *J Cardiovasc Surg (Torino)*. 2009 Jul, 50(3): 263-73

³ Lavery LA, Armstrong DG, Wunderlich RP, et al. Risk factors for foot infections in individuals with diabetes. *Diabetes Care*. 2006;29:1288-93

⁴ International Diabetes Federation Atlas – 8th edition 2017: page 92.

⁵ Whiting, D. R., Guariguata, L., Weil, C., and Shaw, J. 2011. "IDF Diabetes Atlas: Global Estimates of the Prevalence of Diabetes for 2011 and 2030." *Diabetes Res. Clin. Pract.* 94(3): 311-21.

⁶ Wounds International Best practice guidelines: wound management in diabetic foot ulcers. 2013

⁷ Armstrong 2011 *Journal of diabetes Science and Technology* citing The Sage Group. Diabetic foot ulcers, peripheral arterial disease and critical limb ischemia

