

## Latest Statistics

- There are 2.6 million people with diagnosed diabetes in the UK. There are predicted to be 500,000 who have the condition but are unaware of it. There are 11,859 in TH (2010), prevalence of 6.1% ( nationally 4.26% ).
- In the UK approximately 5,000 people with diabetes have an amputation every year ( ~100 a week ).
- Diabetes is the 2<sup>nd</sup> most common cause of lower limb amputation after trauma.

( Diabetes UK )

## The Diabetic Foot



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1. Studies show diabetes is 5 times more common in South Asian and 3 times more common in Afro/Caribbean populations. ( ? lifestyle changes eg diet/activity/obesity and ? increases in insulin resistance )
2. Foot complications are the most common reasons for the admission of the diabetic patient into hospital. ( Edmonds et al 1999 )
3. In 2001 foot ulceration and amputation cost the NHS £244m. ( Gordois et al 2003 )
4. There are associated costs to social services and ultimately to the patient in terms of incapacity and mental wellbeing.
5. Between 70%-90% of all lower limb amputations are preceded by foot ulcer.

## Diabetic Complications

### Macrovascular

- Ischaemic Heart Disease IHD
- Peripheral Vascular Disease PVD
- Cerebrovascular Disease CVD

### Microvascular

- Retinopathy
- Nephropathy
- Neuropathy

## The Neuropathic Foot

- The neurological system is made up of peripheral (nerves) and central (brain and spinal cord) components.
- Diabetic neuropathy particularly affects the posterior roots and the posterior column of the spinal cord (sensory neuropathy)
- However all components of the nervous system may be affected to varying degrees.



## The Neuropathic Foot

SENSORY

MOTOR

AUTONOMIC



## Sensory Neuropathy

- Loss of pain (small fibre neuropathy)
  - Loss of vibration
  - Loss of proprioception
  - Loss of touch
  - Loss of temperature (small fibre neuropathy)
  - Reduced/absent tendon reflexes
  - **RESULT: Lack of protective pain sensation**
- ( A small number of patients have a small fibre neuropathy with impaired pain and temperature perception but with intact touch and vibration ).

## Motor Neuropathy

- Denervation of leg and foot muscles = atrophy and paralysis/weakness = flexion deformities
- Reduction/loss of tendon reflexes
- Extensor plantar response ( +ve Babinski' s sign )
- Cavus deformity of arch
- Prominent metatarsal heads
- New areas of increased pressure = greater risk of ulcer formation



## Autonomic Neuropathy

- Autonomic function involves innervation and co-ordination of organs and the maintenance of homeostasis.
- Clinically;
- Dry skin with fissuring
- Loss of sweating
- Bounding pulses
- Distended veins (A-V shunting)
- Postural hypotension/faints



## Neurological Assessment

- Burning sensation
- Hot and cold sensation
- Numbness
- Pins and needles
- Tightness
- Heightened awareness of sensation
- Lancing pains

## Neurological Assessment

- **SENSORY**
- Light touch      Cotton wool; 10g Monofilament
- Vibration      128Hz tuning fork; Neurothesiometer (when applied to foot delivers vibratory stimulus, which increases as voltage is raised. If unable to feel 25v stimulus then at risk of ulceration)
- Proprioception      Movement
- Temperature      Warm/cold tubes
- Pain      Neuropen/Neurotip

## Neurological Assessment

- **MOTOR**
- **Clinical signs** High arch, prominent met. heads, proximal muscle wasting/atrophy. Also weakness when walking or climbing stairs.
- **Clinical Tests**
  - Assessment of muscle power
  - Assessment of muscle tone
  - Limb reflexes - Patellar
    - Ankle
- Testing reflexes tests the sensory and the motor system at that level.

## Neurological Assessment

- **AUTONOMIC**
- **Clinical signs** Dry skin over feet due to decreased sweating. Skin on heels especially may be cracked/fissured increasing risk of ulceration
  - Distended veins over dorsum of foot secondary to arterio-venous shunting ( Wards sign )
  - Strong bounding pulses.
  - Postural hypotension/faints. Also pulse/BP changes in response to posture change.

## The Neuroischaemic Foot



## The Neuroischaemic Foot

- Cold/cool foot with temperature gradient.
- Reduced or absent pedal pulses.
- Intermittent claudication.
- Rest pain.
- Deceptively healthy colour.
- Nail dystrophy.
- Soft tissue atrophy.
- Dry skin, minimal callous – glassy
- Absence of hairs
- Painful foot.

## Vascular Assessment

- There are 3 pulses in the foot that can be palpated: the dorsalis pedis, posterior tibial and anterior tibial pulses.
- In practice only the dorsalis pedis and posterior tibial pulses are palpated. If either of these are present then it is highly unlikely that there is significant ischaemia.



## Vascular Assessment

- A hand held Doppler can be used to confirm the presence of pulses. Used with a sphygmomanometer the brachial and ankle systolic pressures can be measured. The ratio of ankle to brachial gives the pressure index ( ABI ).

ABI score	Suggested level of peripheral arterial disease
>0.9	None ( ? Calcified arteries )
0.75-0.9	Mild
0.4-0.75	Moderate
<0.4	Severe

## Vascular Assessment

- Many diabetic patients have medial arterial calcification, giving an artificially elevated systolic pressure, even in the presence of ischaemia. This would lead to a 'false negative' reading. Other means to assess flow in the foot are then required, such as trophic changes, colour, temperature, Doppler arterial waveform, transcutaneous oxygen tension or toe systolic pressures.
- Intermittent claudication; cramping or other pain in legs and/or buttocks when walking relieved on rest.
- Rest/Nocturnal pain; described as burning pain in feet usually at night caused by ischaemia to skin and underlying tissues.

## Vascular Assessment

- Bruits; these are abnormal sounds in arteries caused by turbulence from obstruction in the artery.
- Buerger's Test; the limb is elevated for ~1 minute so that the dorsal veins empty, and the sole of the foot becomes pale. The limb is lowered to dependency, and the time it takes for normal colour to return is noted.
  - >20s indicates delay in perfusion
  - 40s + indicates ischaemia
- Capillary refill; thumb pressure causes blanching of superficial tissues.
  - 3-5s normal skin colour should return
  - >5s compromised micro-circulation

## Assessment of the 'at risk' foot

- Neuropathy
- Ischaemia
- Obesity
- History of ulceration
- Footwear and hosiery
- Bony deformities
- Abnormal biomechanics
- Presence of corns or callosity
- Decreased joint mobility
- Age
- Alcohol abuse
- Visual impairment
- Smoking history
- Amputation! ( 50% will lose contralateral leg within 4 years )

## Staging the diabetic foot

The natural history of the diabetic foot can be divided into seven stages.

- STAGE 1 : no risk factors of neuropathy, ischaemia, deformity, callous etc.
- STAGE 2 : no risk factors, but in need of podiatry.
- STAGE 3 : high risk, developed one or more risk factors, will be neuropathic or neuroischaemic.
- STAGE 4 : has skin breakdown, usually ulcer but could be blister, graze, ingrowing toenail etc
- STAGE 5 : has developed infection with cellulitis

- STAGE 6 : necrosis has supervened, in the neuropathic foot infection is usually the cause, in the neuroischaemic foot it is the most common cause but ischaemia contributes.
- STAGE 7 : the foot cannot be saved and a major amputation is likely.

Most diabetic feet will fall under one of the seven stages. Exceptions to these criteria are the Charcot foot, neuropathic fracture and painful neuropathy.

## Multidisciplinary Management

- At each stage of the diabetic foot, it is necessary to intervene early and take control of the foot to prevent further deterioration.
- A foot ulcer is a sign of systemic disease and successful management needs the expertise of a multidisciplinary team.
- In Tower Hamlets ulcer clinics are held most days within the Diabetes Centre at Mile End hospital. Patients also have access to emergency care which is run daily in accordance with NICE guidelines for managing the diabetic foot.

## Educational Control

- It is easy to teach people the theory of foot care, but extremely difficult to change behaviour.
- Patients should be strongly encouraged to perform daily inspection of feet.
- Any verbal advice needs to be reinforced with written advice.
- Education should be adapted to make it relevant for patients of varying ages, backgrounds and cultures.
- Frequent educational updating of neuropathy and peripheral vascular disease and reassurance that good control can delay or prevent complications is key.

**DIABETIC FOOT ASSESSMENT FORM**

Clients  
Name/Address.....  
.....dob.....

GP details.....

	Right foot	Left foot		Right foot	Left foot
Dorsalis pedis pulse			Painful neuropathy		
Posterior tibial pulse			Pain (other)		
Intermittent claudication			Ulcer		
Rest pain			Previous amputation		
Monofilament sensation (10 g)			Deformity		
Vibration at hallux			Oedema		
Charcot foot			Suitable footwear	yes	no

**RISK CATEGORY – STAGING** (see reverse of form)

1. no risk	2. no risk, needs podiatry	3. high risk: neurovascular/neuroischaemic	4. ulcerated	5. cellulitic	6. necrotic	7. major amputation
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Reason for referral to Foot Health Department/comments

SITE	REFERRAL METHOD	CONTACT
Foot Health Department Mile End Hospital Bancroft Road London E14 4DG Tel: 020 8223 8849 Fax: 020 8223 8941	Letter or fax for non-urgent referrals.	Rita Chauhan Office Manager
Diabetes Care Centre Mile End Hospital Bancroft Road London E14 4DG Tel: 020 223 8836 Fax: 0208 223 8806	Letter/fax or telephone the clinic for urgent cases.  Clinics are held on the following days: Monday morning all day Tuesday all day Wednesday pm only Thursday all day Friday no clinic	Podiatrists,  Victoria Griffin Anita Maccalla Zab Rashid
Emergency Clinic Foot Health Department Patients need to attend at 9am on Monday to Friday	The emergency clinic is for the treatment of bleeding or infected lesions when the patient is unable to wait for an appointment at the above clinics.	Clinician on duty

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