Diabetes Study Day

4th July 2017

Diabetes Podiatry Service
Sarah Jane Hayhurst
Diabetes Lead Podiatrist
Diabetes: Worldwide

- Diabetes is a global epidemic.
  - In 2015 415 million people had DM.¹
- UK DM Prevalence 2016 = 5.6%.²
  - 3.6 million diagnosed with DM.²
  - A further 1 million undiagnosed T2.²

International Diabetes Federation Diabetes Atlas, 7th Ed, 2015
Diabetes

- The prevalence of DM is nearly 3 x higher than the prevalence of all cancers combined.²

Diabetes UK, State of the Nation, 2016
• NHS Rotherham CCG
  – Resident population 260,100,
  – 48,900 are over 65-years of age,
    • 8.9% of the population have DM,
    • Compared with 6.4% in England.\(^3,12\)

• Diabetic Foot Ulcers
  – 15 - 25% lifetime incidence.\(^4\)
  – Annual incidence 1.9 - 4.1%.\(^5-7\)
  – This equates to approximately 380 – 779 active ulcers per year in the Rotherham area

Current active diabetic foot disease caseload – 201.
National Diabetes Foot Care Audit 2014 – 2016

We have larger, deeper ulcers with more infection
The Rotherham NHS Foundation Trust

ambitious, caring, together

Major amputations per 1,000 people aged 17+ with diabetes

Minor amputations per 1,000 people aged 17+ with diabetes
Gold Standard Care - Guidelines
Active Diabetic Foot Disease
All Guidelines

- Optimal glycaemic control
- Optimal wound care
- Optimal offloading
- Aggressive management of infection
- Access to vascular
- Access to imaging
- Education
So what is the problem?
The Diabetes Education & Resource Centre

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Loss of protective Sensation
Signs and symptoms of peripheral neuropathy [13]

- “Feet feel asleep” / numbness / “dead feeling”
- Tingling / pins and needles / “ant bites”
- Burning pain
- Shooting pains / “like electric shock”
- Lancinating pains / “knife like”
- Contact pain, often with day-time clothes and bedclothes on (alldynia)
- Pain on walking described as “walking barefoot on marbles” or walking barefoot on hot sand or broken glass.
- Sensations of heat or cold in the feet, persistent achy feeling in the feet, cramp-like sensations in the legs
- Foot ulceration
- Ataxia (a lack of muscle control during voluntary movements)
- Weakness
- Falls
- Orthostatic hypotension
- Nocturnal exacerbations
Inspect for foot deformity

- Charcot / rocker bottom deformity
- High plantar pressure sites
- Intrinsic minus foot
- Hallux abducto valgus
- Toe deformities: Hammer / Mallets / Clawing
Signs and symptoms of PVD [14]

- Skin colour may be pale / white
- Skin appearance thin / fragile “Parchment-like”
- Hair less
- Muscle atrophy
- Weak pulses / pulse less
- Cool to cold temperature
- Atrophic nails
- Capillary refilling time >3 seconds
- Intermittent Claudication
- Rest pain
- Cyanosis
- Tissue loss/ ulceration
- Gangrene
Ankle Brachial Pressure Index
Toe pressures/ Toe Brachial Index [15]

<table>
<thead>
<tr>
<th>Grade</th>
<th>ABPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>0.91 - 1.30</td>
</tr>
<tr>
<td>Mild</td>
<td>0.60 – 0.90</td>
</tr>
<tr>
<td>Moderate</td>
<td>0.40 – 0.60</td>
</tr>
<tr>
<td>Severe</td>
<td>&lt; 0.40</td>
</tr>
<tr>
<td>Poorly Compressible</td>
<td>$&gt; 1.30$</td>
</tr>
</tbody>
</table>
Toe pressures/Toe Brachial Index
Pathway to Ulceration in Patient with DM [modified from 20 & 21]

**Motor**
- Muscle wasting & atrophy (weakness)
- Deformity
- Abnormal pressure
- High plantar pressure
- Callus formation

**Sensory**
- Loss of protective sensation
- Loss of biological incentive to seek help

**Autonomic**
- Anhidrosis & dry skin
- ↓Sympathetic tone (altered blood flow regulation)

**Charcot**

**DPN (Micro)**

**Vascular**

**Micro**
- Structural: Capillary BM thickening
- Functional: AV Shunting

**Macro**
- Structural: Atherosclerosis
- Occlusive narrowing (stenosis)
- Critical limb ischemia

↓Nutrient Capillary Blood Flow

**Ischemia**

**ESRF & Dialysis**

**Impaired response to infection**

**Amputation**

**Diabetic Foot Ulcer**
- (Anemia, nutritional deficit)

Fractions of Trauma (Footwear & Barefoot Walking)

**ESRF & Dialysis**

**Impaired response to infection**

**Amputation**
Things we need to look for

- Fungus
- Nail care: thickened, damaged, fungal infection
  - In growing toe nails +/- infection
- Corns
- Callus
Podiatry Treatment
If you can’t see it, how can you assess it?
Wound bed preparation & debridement - if required and safe - based on aetiology!

Pre-debridement WA

Post-debridement WA
Remove devitalised tissue and reduce bacterial burden!

Wound bed description and severity in notes is dependent on debridement!
No debridement = eschar (necrosis?)  With debridement = granulating
Cover & clean all wounds

- Always clean the wound with sterile solution (saline/water)
- Cover with a sterile dressing
- Monitor the wound, if the wound deteriorates inform ward doctors
- Refer to Dr Franke Endocrine Consultant
- Refer Podiatry
- Refer Tissue Viability Nurses
### Typical features of Diabetic Foot Ulcers according to aetiology

<table>
<thead>
<tr>
<th>Feature</th>
<th>Neuropathic</th>
<th>Ischaemic</th>
<th>Neuroischaemic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensation</td>
<td>Sensory loss</td>
<td>Painful</td>
<td>Degree of sensory loss</td>
</tr>
<tr>
<td>Callus/necrosis</td>
<td>Callus present and often thick</td>
<td>Necrosis common</td>
<td>Minimal callus Prone to necrosis</td>
</tr>
<tr>
<td>Wound bed</td>
<td>Pink and granulating, surrounded by callus</td>
<td>Pale and sloughy with poor granulation</td>
<td>Poor granulation</td>
</tr>
<tr>
<td>Foot temperature and pulses</td>
<td>Warm with bounding pulses</td>
<td>Cool with absent pulses</td>
<td>Cool with absent pulses</td>
</tr>
<tr>
<td>Other</td>
<td>Dry skin and fissuring</td>
<td>Delayed healing</td>
<td>High risk of infection</td>
</tr>
<tr>
<td>Typical location</td>
<td>Weight-bearing areas of the foot, such as metatarsal heads, the heel and over the dorsum of clawed toes</td>
<td>Tips of toes, nail edges and between the toes and lateral borders of the foot</td>
<td>Margins of the foot and toes</td>
</tr>
<tr>
<td>Prevalence (based on35)</td>
<td>35%</td>
<td>15%</td>
<td>50%</td>
</tr>
</tbody>
</table>
WA Check List

- Wound history/causal factors
- Aetiology
- Type of wound
- Location
- Wound bed
- Size (PROBING / STATIC = WHY)
- Underlying tissues
- Wound edges (UNDERMINING?)
- Periwound
- Exudate type & consistency
- Odour
- Pain (IN NEUROPATHIC PATIENT?)
- INFECTION
- Suspicion of malignancy
- Classification

Chronic neuropathic ulcer, 1.5 yrs, A1 TWC

1st PMA – transfer lesion, no pain
100% unhealthy granulation
Size 1.6cm x 1.3cm, 0.3cm, no probing
Macerated fibrotic edges
Periwound macerated callus
Heavy serous exudate, no odour
No overt signs of infection
## Signs and Symptoms of Wound Infection

<table>
<thead>
<tr>
<th>Classical signs</th>
<th>Additional signs (may be the only signs?)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Erythema</td>
<td>- Delayed healing (static wounds)</td>
</tr>
<tr>
<td>- Heat</td>
<td>- Dark/discoloured granulation tissue</td>
</tr>
<tr>
<td>- Oedema</td>
<td>- Increased friability (tissue that bleeds easily)</td>
</tr>
<tr>
<td>- Increasing pain</td>
<td>- Bridging of skin across a wound</td>
</tr>
<tr>
<td>- Purulent exudate</td>
<td>- Wound breakdown</td>
</tr>
<tr>
<td></td>
<td>- Altered odour (foul)</td>
</tr>
<tr>
<td></td>
<td>- Change in colour (green)</td>
</tr>
<tr>
<td></td>
<td>- Pocketing at the base of the wound</td>
</tr>
<tr>
<td></td>
<td>- Increased water/serous exudate rather than pus</td>
</tr>
<tr>
<td></td>
<td>- Painful/Altered sensation to the wound site/surrounding skin</td>
</tr>
</tbody>
</table>

**Classical signs may be absent or reduced**
- PAD
- Diabetes
- ESRF
- Immunosuppressed
PROBING - Hidden Depths
Neuroischaemic Ulcer with Cellulitis and Lymphangitis
Four Stages of wound healing

Stage 1: Haemostasis
- Initial bleeding
- Vasoconstriction of vessels to minimise blood loss
- Platelet aggregation
- Temporary clot formation

Stage 2: Inflammatory Response
- Release of inflammatory mediators
- Vasodilatation
- Phagocytosis commences
- Increased permeability of vessels
- Localised swelling, redness & tenderness
- Macrophages release growth factors
- Regulation of healing process

Stage 3: Proliferation
- Macrophages stimulate angiogenesis
- Promotion of new tissue
- Proliferation of connective tissue
- Wound decreases in size by granulation, contraction and epithelialisation

Stage 4: Maturation
- This phase can last for many months; initially the scar is red and raised
- In time the blood supply to the area reduces and the scar will become pale and flatten
<table>
<thead>
<tr>
<th>Type of tissue in the wound</th>
<th>Therapeutic goal</th>
<th>Role of dressing</th>
<th>Treatment options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Necrotic, black, dry</td>
<td></td>
<td></td>
<td>Wound bed preparation, primary dressing, secondary dressing.</td>
</tr>
<tr>
<td>Sloughy, yellow, brown, black or grey, dry to low exudate</td>
<td></td>
<td></td>
<td>Consider barrier products.</td>
</tr>
<tr>
<td>Sloughy, yellow, brown, black or grey, moderate to high exudate</td>
<td></td>
<td></td>
<td>Consider barrier products.</td>
</tr>
<tr>
<td>Granulating, clean, red</td>
<td>Promote granulation</td>
<td>Maintain moisture balance</td>
<td>Wound cleansing</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------</td>
<td>--------------------------</td>
<td>----------------</td>
</tr>
</tbody>
</table>
| Dry to low exudate     | Provide healthy wound bed free of debris | Balance | Wound cleansing | Pad and/or occlusive dressing bandage. Hydrocolloid and Hydrogel bandages should be used with caution due to risk of allergic reaction. 

- Granulating, clean, red
- Moderate to high exudate

- Epithelialising, red, pink
- No to low exudate

- Infected
- Low to high exudate

The purpose of this table is to guide the care of wounds. Different types of wounds require different care. The table outlines various care options for different wound stages and conditions. Where wounds contain mixed tissue types, it is important to consider the specific needs of each tissue type and adjust care accordingly. Where infection is suspected, it is important to regularly inspect the wound and consider appropriate antimicrobial agents. Wound dressings should be used in combination with appropriate wound bed preparation to promote healing and manage exudate. Offloading and diabetic control are key factors in managing chronic wounds.

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<table>
<thead>
<tr>
<th>Type</th>
<th>Actions</th>
<th>Indications/use</th>
<th>Precautions/contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alginites/CMC*</td>
<td>Absorb fluid</td>
<td>Moderate to high exuding wounds</td>
<td>Do not use on dry/necrotic wounds</td>
</tr>
<tr>
<td></td>
<td>Promote autolytic debridement</td>
<td>Special cavity presentations in the form of rope or ribbon</td>
<td>Use with caution on friable tissue (may cause bleeding)</td>
</tr>
<tr>
<td></td>
<td>Moisture control</td>
<td>Combined presentation with silver for antimicrobial activity</td>
<td>Do not pack cavity wounds tightly</td>
</tr>
<tr>
<td></td>
<td>Conformability to wound bed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foams</td>
<td>Absorb fluid</td>
<td>Moderate to high exuding wounds</td>
<td>Do not use on dry/necrotic wounds or those with minimal exudate</td>
</tr>
<tr>
<td></td>
<td>Moisture control</td>
<td>Special cavity presentations in the form of strips or ribbon</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conformability to wound bed</td>
<td>Low adherent versions available for patients with fragile skin</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Combined presentation with silver or PHMB for antimicrobial activity</td>
<td></td>
</tr>
<tr>
<td>Honey</td>
<td>Rehydrate wound bed</td>
<td>Sloughy, low to moderate exuding wounds</td>
<td>May cause “drawing” pain (osmotic effect)</td>
</tr>
<tr>
<td></td>
<td>Promote autolytic debridement</td>
<td>Critically colonised wounds or clinical signs of infection</td>
<td>Known sensitivity</td>
</tr>
<tr>
<td></td>
<td>Antimicrobial action</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrocolloids</td>
<td>Absorb fluid</td>
<td>Clean, low to moderate exuding wounds</td>
<td>Do not use on dry/necrotic wounds or high exuding wounds</td>
</tr>
<tr>
<td></td>
<td>Promote autolytic debridement</td>
<td>Combined presentation with silver for antimicrobial activity</td>
<td>May encourage overgranulation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>May cause maceration</td>
</tr>
<tr>
<td>Hydrogels</td>
<td>Rehydrate wound bed</td>
<td>Dry/low to moderate exuding wounds</td>
<td>Do not use on highly exuding wounds or where anaerobic infection is suspected</td>
</tr>
<tr>
<td></td>
<td>Moisture control</td>
<td>Combined presentation with silver for antimicrobial activity</td>
<td>May cause maceration</td>
</tr>
<tr>
<td></td>
<td>Promote autolytic debridement</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cooling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iodine</td>
<td>Antimicrobial action</td>
<td>Critically colonised wounds or clinical signs of infection</td>
<td>Do not use on dry necrotic tissue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low to high exuding wounds</td>
<td>Known sensitivity to iodine</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Short-term use recommended (risk of systemic absorption)</td>
</tr>
<tr>
<td>Dressing Type</td>
<td>Description</td>
<td>Wound Characteristics</td>
<td>Notes</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Low-adherent wound contact layer (silicone)</td>
<td>Protect new tissue growth</td>
<td>Low to high exuding wounds</td>
<td>May dry out if left in place for too long Known sensitivity to silicone</td>
</tr>
<tr>
<td>PHMB</td>
<td>Antimicrobial action</td>
<td>Low to high exuding wounds Critically colonised wounds or clinical signs of infection</td>
<td>Do not use on dry/necrotic wounds Known sensitivity</td>
</tr>
<tr>
<td>Odour control (eg activated charcoal)</td>
<td>Odour absorption</td>
<td>Malodorous wounds (due to excess exudate) May require antimicrobial if due to increased bioburden</td>
<td>Do not use on dry wounds</td>
</tr>
<tr>
<td>Protease modulating</td>
<td>Active or passive control of wound protease levels</td>
<td>Clean wounds that are not progressing despite correction of underlying causes, exclusion of infection and optimal wound care</td>
<td>Do not use on dry wounds or those with leathery eschar</td>
</tr>
<tr>
<td>Silver</td>
<td>Antimicrobial action</td>
<td>Critically colonised wounds or clinical signs of infection Low to high exuding wounds Combined presentation with foam and alginates/CMC for increased absorbency Also in paste form</td>
<td>Some may cause discoloration Known sensitivity Discontinue after 2 weeks if no improvement and re-evaluate</td>
</tr>
<tr>
<td>Polyurethane film</td>
<td>Moisture control breathable bacterial barrier transparent allow visualisation of wound</td>
<td>Primary dressing over superficial low exuding wounds Secondary dressing over alginate or hydrogel for rehydration of wound bed</td>
<td>Do not use on patients with fragile compromised periwound skin Do not use on moderate to high exuding wounds</td>
</tr>
</tbody>
</table>

Other more advanced dressings (eg collagen and bioengineered tissue products) may be considered for wounds that are hard to heal. *Wound dressings may contain alginates or CMC only; alginates may also be combined with CMC.*
Inform patient of diabetic foot emergency advise/what to look for & where to get help.
No risk factors
Callus alone is considered low risk

Annual screening by trained Healthcare Professional
MODERATE

Deformity * or
Neuropathy (loss of sensation) or
Lower limb peripheral arterial disease

Refer to specialist podiatrist
Previous ulceration or
Previous amputation or
On renal replacement therapy (dialysis or transplant) or
Neuropathy (loss of sensation) and lower limb peripheral arterial disease together or
Neuropathy (loss of sensation) in combination with callus and/or deformity* or
Lower limb peripheral arterial disease in combination with callus and/or deformity*

Refer to specialist podiatrist
Ulceration or
Spreading infection or
Critical limb ischemia (severe peripheral arterial disease)

Gangrene

Suspicion of acute Charcot foot or an unexplained hot, red, swollen foot with or without pain

Rapid referral (within one working day) MDT, for triage within one further working day
Red, hot, swollen!

https://goutandyou.com/gout-in-pictures/
Types of off-loading devices

KEY: FW = forefoot wounds, MW = midfoot wounds, HW = heel wounds

Non-pneumatic removable cast walker (RCW) (FW, MW)

Heel wedge half-shoe (HW)

Total contact insole (prevention & post-healing)

Peg-assist insert, used in combination with RCW or post-op shoe (FW, MW, HW)

Pneumatic RCW (FW, MW)

Total contact cast (FW, MW)

Forefoot wedge half-shoe (FW)

Wound care rocker shoe (FW, MW)
ADVISE THE PATIENT TO:

- Check their feet every day
- Be aware of loss of sensation
- Look for changes in the shape of their foot
- Do not use corn removing plasters or blades
- Know how to look after their toenails
- Wear shoes that fit properly
- Maintain good blood glucose control
- Attend their annual foot review
Take home message

Diabetic foot ulcers precede up to 83% of major amputation [22] and 93% of minor amputations [22].

85% are preventable [23]

The Diabetes Education & Resource Centre

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NOW... Hands on !!
References

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