

Chapter 7: Neuropathic Ulcers

Introduction

Chapter 7 provides the following information on neuropathic ulcers:

1. *Definition and Characteristics*
2. *Risk Assessment and Education for Neuropathic Ulcers*
3. *Diagnostics*
4. *Prevention Strategies*
5. *Care Issues*
6. *Wound Base Descriptors*
7. *Moist Interactive Wound Healing Decision Tree*
8. *Adjunctive Therapies*
9. *When To Seek Consultation*

1. Definition and Characteristics

Definition

Neuropathic ulcers are related to the loss of protective sensation (LOPS) in the feet and legs as a result of a primary neurological condition, metabolic disease process (e.g., diabetes and/or renal failure), trauma, or surgery.

Characteristics

Neuropathic ulcers are usually painless unless an arterial component or infection is present. They have even, well-defined wound margins with or without undermining. The extent of necrotic tissue is variable. Granulation is frequently present, and exudate varies. Variable depth is often associated with thick callus.

Neuropathic ulcers are typically located on weight-bearing surfaces (i.e., plantar surface of foot), metatarsal heads, and heels, all of which are sites of painless and minor repetitive trauma. People with neuropathic ulcers often have an altered gait, orthopedic deformities, and infection at the ulcerated site.

2. Risk Assessment and Education for Neuropathic Ulcers

Non-diabetics

- assessment and education requires a multidisciplinary team including but not limited to specialist, clinic, occupational therapist, physiotherapist, physiatrist, neurologist, dermatologist
- hypercholesterolemia
- hypertriglyceridemia
- hypertension
- history of angina, myocardial infarction, or CVA (cerebral vascular accident)

Persons with Diabetes

Assessment

Persons with diabetes should be examined regularly by a physician, clinic or an appropriate clinician for an assessment of diabetic control and an examination of the lower legs and feet. The investigation should include:

- glycosylated hemoglobin
- Sensory, Autonomic, Motor assessment (SAM)
- monofilament testing
- palpation of peripheral pulses
- screening for foot deformities that may act as pressure points and increase the risk of ulcerations
- screening for individuals who may have associated co-morbidities

1. Diabetics can also develop pressure ulcers, venous stasis ulcers, and arterial ulcers. It is important to accurately determine the ulcer type in order to plan for appropriate treatment.
2. Orthotic devices are available from a number of certified orthotists or prosthetists. The person may be responsible for the cost of these devices if no third-party coverage is in place.
3. In order for healing to occur, pressure on the neuropathic ulcer must be relieved or reduced with temporary off-loading footwear, Aircast walkers, or total contact casts. Consider using wheelchairs and crutches to significantly decrease weight-bearing.
4. Neuropathic pain may be described as burning, tingling, pins and needles, icy cold sensation, bugs crawling etc. Neuropathic pain should be noted and reported to an appropriate specialist or clinician.

Education

Patient education helps to prevent complications. For patients with diabetes this should include:

- education on glucose control through appropriate diet, exercise, and medication
- education on foot hygiene, foot care, and footwear

If the professionals involved in the patient's care cannot provide this information, the person should be referred to a diabetic teaching clinic, such as the Diabetic Education Centres throughout VIHA.

3. Diagnostics

X-Ray

- Use x-ray to rule out foreign body in tissues, which is common with neuropathic plantar ulcers.
- Use x-ray to initiate diagnosis of Charcot foot.
- X-ray cannot be used to demonstrate acute osteomyelitis.
- Laser Doppler diagnostics are available at Victoria Foot and Leg Ulcer Clinic.

Thermoscan

- Measures temperature gradients between feet.
- Available only in specialty clinics.

Bone Scan

- Use bone scan to rule out acute osteomyelitis.
- Use bone scan to determine level of progression of Charcot foot.

Dopplers and Angiography

- Individuals with ulcers on lower legs or feet and absent or decreased pulses should undergo Doppler studies or angiograms* to determine existence of peripheral vascular disease.
- * Individuals with elevated creatinine levels should be thoroughly assessed for kidney function prior to angiography because angiogram dye may intensify renal failure. Ensuring hydration and the use of an oral acetylcystine may protect against dye-induced renal failure. Referral to a kidney specialist may be indicated in some patients with renal insufficiency.

Glycosylated Hemoglobin

- Regular blood glucose monitoring (A_{1c} test) measures the amount of glycosylated hemoglobin in the blood and gives a good indication of how well diabetes is being managed over time.

Monofilaments

- Use monofilaments to assess protective sensation.
- Occupational therapists, physical therapists, clinical nurse specialists, advanced practice nurses, and physicians should have access to monofilaments for this assessment.
- Patients can be taught to self-test with monofilaments.

Probe Wound with Blunt-Tipped Probe

- Use to assess sinus tracks.
- Use to determine the depth and tissue structures involved.
- Use to determine whether or not the probe reaches bone. In the diabetic foot, if one can probe bone within the ulcer, there is a high probability that the underlying bone is infected.
- **Note:** Refer patient to an appropriate specialist if the probe detects tendons, capsule, or bone (Grayson 1995).

Wound Culture

- Culture the wound if it is appropriate to do so.
 - *See also Chapter 2: Infection Prevention and Control – Diagnostic Tests for Wound Infection*

Additional Diagnostics

- Compression Decision Tree

- See also:

Chapter 6: Venous Stasis Ulcers – Compression Decision Tree

Appendix K: Diagnostic Tests – Definitions & Descriptions

- X-ray to rule out suspected osteomyelitis (x-ray can not identify acute osteomyelitis)
- Bone scan with or without gallium scan to rule out osteomyelitis
- Transcutaneous oxygen measurement (T-COM)

- See also *Appendix K: Diagnostic Tests – Definitions & Descriptions*

- Skin perfusion pressure (SPP), laser Doppler
- Orthotic and prosthetic review
- MRI for suspected osteomyelitis
- Photoplethysmography / systolic toe pressures (PPG)

- See also *Appendix K: Diagnostic Tests – Definitions & Descriptions*

Note: For the immunocompromised neuropathic or elderly patient, pain may be the only symptom of a wound infection.

Diabetics may have a decreased response to pain and an abnormal inflammatory response (Inlow et al., 2000).

- See also *Chapter 3: Wound Care Principles – Systemic Assessment*

4. Prevention Strategies

- It is necessary to undertake consistent, complete, and regular assessments and education of persons at risk for neuropathy in order to prevent complications.
- Early education and assessment of diabetics can help to prevent the development of lower leg complications and the subsequent development of neuropathic ulcers.

- See also *Topic 2: Risk Assessment and Education for Neuropathic Ulcers*

- Decisions regarding wound prevention and treatment should take into consideration the person's environment—the physical setting, the availability of caregiver support, knowledge, and skill, and the availability of resources (Dolynchuk et al., 2000; Maklebust and Siegreen, 2001).

5. Care Issues

- Neuropathic ulcers often develop **sinus tracks, undermining, or deep abscess**. The ulcers must therefore be probed to determine whether or not these conditions exist.
- **Deep tissue cultures** should be taken from ulcers that show clinical signs of infection to assess bacterial contamination.

- **Caution:** Occlusive hydrocolloid wafers are not recommended for neuropathic ulcers, but pastes and gels may be used (Foster et al., 1997).

6. Wound Base Descriptors

RED/YELLOW/BLACK (RYB) is a classification tool used to assess the characteristics of the tissue in the wound bed (Bryant, 2000; Cooper, 2000). Use this classification tool to classify, describe and treat venous stasis ulcers.

RED: Clean and uniformly pink to red.
Often heals by secondary intention.
Dressings need to be changed less often but should be moist at all times.

YELLOW: Varies from ivory to canary yellow or even green in colour, depending on whether or not infection is present.

Caution: Tendon may appear as yellow or white

The goal of care is to manage, exudate, and remove slough through surgical, enzymatic, or autolytic debridement.

Not all Yellow is detrimental to healing—granulation grows through yellow fibrin

BLACK: Ranges in colour from dark brown and gray to black.

The goal for most individuals is to remove the necrotic tissue by surgical, enzymatic, or autolytic debridement.

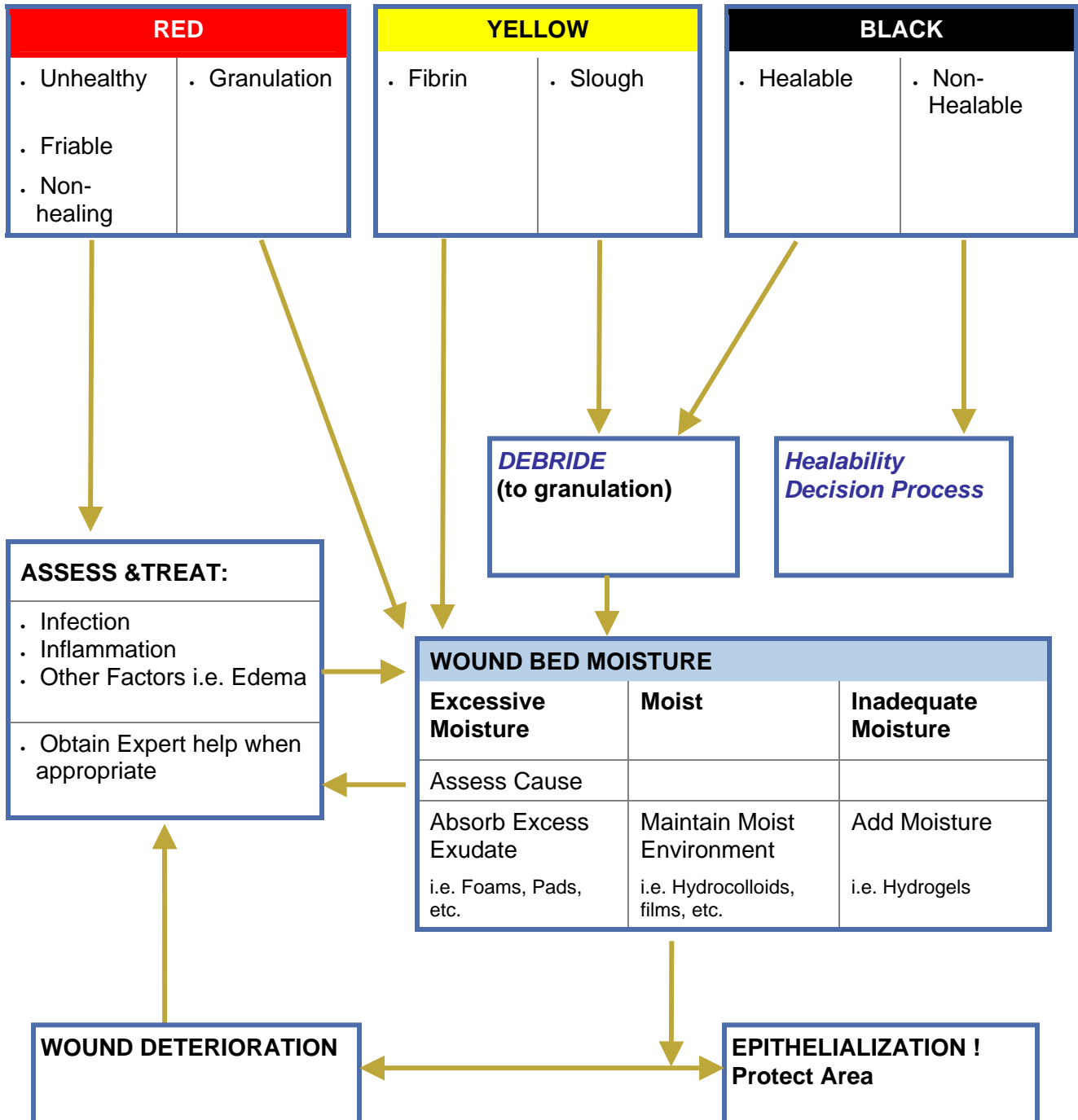
Where there is no drainage or there is boggy surrounding tissue, leave the hard, dry eschar or black scab intact on the lower legs, feet, or heels of individuals whose healing potential is compromised by inadequate circulation. It provides a protective base for the wound.

- See also Chapter 3: Healability

- See also Chapter 3: Moist Interactive Wound Healing Decision Tree

If all three colours are present, target the treatment for the colour that is present in more than 50% of the wound (Cooper, 2000).

7. Moist Interactive Wound Healing Decision Tree



8. Adjunctive Therapies

Adjunctive (secondary) therapies include:

- hyperbaric oxygen therapy—*see Appendix D: Descriptions of Adjunctive Therapies*
- electrical modalities
- gene therapy*
- human growth factors*
- human skin equivalents
- laser
- vacuum-assisted wound closure (V.A.C.) —*see Appendix E: Vacuum Assisted Closure*

* Research regarding the efficacy of some adjunctive therapies is inconclusive. Practitioners using these modalities should be trained appropriately and should understand the rationale and expected outcome for the wound and the patient.

9. When To Seek Consultation

Persons with neuropathic ulcers should be referred to an appropriate Specialist, Clinic or Clinician under each of these circumstances:

- Wound deterioration or no signs of healing.
- Multi-system complications.
- Non-healing stage 3 or 4 pressure ulcers.
- Probes to bone.
- Suspected acute Charcot fractures.
- Sudden onset of pain in ulcerated area as this may indicate infection.

- *See also Appendix F: Wound Management Team Roles*

RECOMMENDATION

All individuals with neuropathic foot ulcers should be referred to a specialist.