Chronic Wound Management
Diabetic, Venous and Arterial Ulcers – A Summary

Chronic wounds are the most costly wounds all to treat. A prerequisite for optimum wound healing is to identify the cause of the wound before treatment is commenced. A thorough assessment of not only the wound but the patient’s general health, medical history, nutritional status and medication usage is essential. The cause of the wound will dictate, especially in the case of chronic ulcers, the management of the wound including the choice of wound dressings. A multidisciplinary approach is essential in providing the best treatment programme.

INTRODUCTION
Wound healing is a very complex process involving an ordered sequence of events. These events can be summarised as:
The four key stages
1. Thrombus formation/haemostasis
2. Inflammation/inflammatory phase
3. Cell proliferation and repair of the matrix/proliferation phase
4. Epithelialisation and remodelling of scar tissue/maturation phase

In a chronic wound the sequence of events has become deranged and somewhat altered at one or even several stages during the wound healing process. It is therefore essential to address the underlying cause of the wound and also to identify other factors that may contribute to the delay in wound healing.

AETIOLOGY OF CHRONIC WOUNDS

PRESSURE ULCERS
• Shear
• Friction
• Pressure

VENOUS ULCERS
• History of deep vein thrombosis
• Family history of venous disease
• Oedema of the lower leg
• Eczema of the lower leg
• Varicose veins and previous venous surgery
• Skin pigmentation – lipodermatosclerosis

ARTERIAL ULCERS
• History of arteriosclerosis
• History of atherosclerosis
• History of smoking
• Poor skin perfusion

DIABETIC ULCERS
• Neuropathy
• Trauma
• High Plantar Pressures
• Foot deformities
• Peripheral Arterial Disease
• Uncontrolled glucose values

Table 1. Principles of wound healing

<table>
<thead>
<tr>
<th>PRINCIPLES OF WOUND HEALING</th>
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<tbody>
<tr>
<td>1. Define the aetiology (the cause of the wound)</td>
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<tr>
<td>2. Identify the intrinsic and extrinsic factors affecting wound healing</td>
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<td>3. Do a thorough wound assessment</td>
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<tr>
<td>4. Select an appropriate treatment programme incorporating moist wound healing principles</td>
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<tr>
<td>5. Plan the aftercare for maintaining the healed/closed wound</td>
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</table>
Chronic Wound Management

Figure 1. Suggested protocol for the investigation of lower leg ulcers and foot ulcers

PROTOCOL FOR INVESTIGATION OF LOWER LEG AND FOOT ULCERS

HISTORY
General medical and family history
Nutritional status
Psycho-social status
Causative factors of the ulcer
Ulcer treatment history

PHYSICAL EXAMINATION
Vital data
Peripheral pulses
Varicose veins or pigmentation
Neurological evaluation
Signs of connective tissue disease
Signs of vasculitis
Signs of lymph drainage disorders

INVESTIGATIONS
Ankle:brachial pressure index (ABPI)
Full blood examination:
• Full blood count
• Renal functions
• Liver functions
• Rheumatoid factors and antibody analysis
• Urea and electrolytes
• Serum albumin and blood glucose

DETERMINATION OF POSSIBLE AETIOLOGY

VENOUS
Venous duplex scan
Transcutaneous oxymetry

MIXED
Venous duplex scan
Consult a vascular surgeon

ARTERIAL
Consult a vascular surgeon
Arteriogram

ARTERIAL
Consult a vascular surgeon
Arteriogram

OTHER
Vasculitic
Infective
Neoplastic
Malignant

MANAGEMENT OF THE ULCER
1. Treatment of the ulcer via moist wound healing dressing products
2. Treating the underlying aetiology
3. Medical management

ALLIED HEALTH PROFESSIONALS
Vascular surgeon
Podiatrist
Orthotist
Nutritionist/dietician
Physiotherapist
Radiologist

MOIST WOUND HEALING THROUGH
Surgical, enzymatic or autolytic debridement of devitalised tissue
Promoting granulation and epithelialisation by controlling the exudate and treating infection
Scar management
Chronic Wound Management

DETERMINING PERIPHERAL ARTERIAL CIRCULATION BY DOING THE ANKLE:BRACHIAL PRESSURE INDEX (ABPI)

The Ankle:Brachial Pressure Index (ABPI) form part of the diagnostic examinations and is of great value in determining the peripheral arterial circulation. ABPI in diabetic ulcers is not very reliable due to the medial arterial calcinosis or Monckeberg’s sclerosis which is often known as a lead-pipe condition. This means that the arteries cannot be compressed by the cuff.

An ABPI of 0.8 is seen by some as the definitive decision-making number and thus has almost become the pivotal point in defining the aetiology of leg ulcers. This cut off value is not, however, substantiated in the literature and the concept of the mixed ulcer, especially in the case of diabetics, should be borne in mind.

DETERMINING THE ABPI BY USING A DUPLEX DOPPLER

Allow the patient to lie quietly for 10 - 20 minutes and explain the procedure to the patient.

1. Measure the brachial systolic blood pressure and use the highest of the two values measured in the arms.
2. Measure the ankle systolic pressure by locating the dorsalis pedis, posterior tibialis and, if required, the peroneal arteries. Use the highest value obtained.
3. Calculate the ABPI by using the formula as set out in Table 3.

False normal values may be obtained when arteriosclerosis or atherosclerosis is present. Diabetics can also have normal readings but this does not exclude small blood vessel disease.

When arterial disease is suspected, the patient needs to be referred to a vascular surgeon for further examination such as duplex doppler sonars and arteriograms.

Table 3. Calculation and interpretation of ABPI

<table>
<thead>
<tr>
<th>Ankle:brachial pressure index</th>
<th>Highest systolic ankle reading</th>
<th>Highest systolic brachial reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-0.9</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>0.9-0.8</td>
<td>Insignificant arterial impairment present</td>
<td></td>
</tr>
<tr>
<td>0.79-0.5</td>
<td>Arterial impairment is present, but the patient is generally symptom free - refer to a vascular surgeon</td>
<td></td>
</tr>
<tr>
<td>&lt; 0.5</td>
<td>Severe arterial disease may be associated with gangrene, ischaemic ulceration or rest pain - refer immediately to a vascular surgeon</td>
<td></td>
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</tbody>
</table>

Figure 2: Occlusion of the main arteries with alternative blood flow creation by the small blood vessels. (Picture provided by Dr. L Tudhope – Vascular Surgeon)
### CHRONIC LOWER LEG ULCERS A DIFFERENTIAL DIAGNOSIS

<table>
<thead>
<tr>
<th></th>
<th>VENOUS</th>
<th>MIXED</th>
<th>ARTERIAL</th>
<th>DIABETIC</th>
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<tbody>
<tr>
<td>SITE/AREA</td>
<td>Ankle area close to the malleolus or anterior tibial area</td>
<td>Mixed clinical features</td>
<td>Lower leg, they occur mainly on the tips of toes, between the toes, also on the lateral aspect of the foot and lateral malleolus</td>
<td>Tip of toes, the heels, under the metatarsophalangeal heads and along the edges of the feet. Ulceration is particularly likely to occur over the dorsal portion of the toes and on the plantar aspect of the metatarsal heads and the heel</td>
</tr>
<tr>
<td>PULSES</td>
<td>Present/normal</td>
<td>Weak of absent</td>
<td>Depending on peripheral arterial disease</td>
<td>Neuropathic</td>
</tr>
<tr>
<td>PAIN</td>
<td>Relieved when leg is elevated</td>
<td>Greater at night/with elevation of leg intermittent claudication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SKIN</td>
<td>Skin pigmentation</td>
<td>Poor skin perfusion</td>
<td>Callus formation on wound edges</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eczema present</td>
<td>Dry, glossy, thin, pale, mottled and cold (unless cellulitis is present)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Induration</td>
<td>Rubor when foot hangs, pallor when elevated</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Varicose veins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Scars of previous ulcers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OEDEMA</td>
<td>Generalised</td>
<td>Mixed features</td>
<td>Localised oedema</td>
<td>Localised oedema</td>
</tr>
<tr>
<td>DEPTH</td>
<td>Large and superficial ulcers</td>
<td></td>
<td>Small, mottled but deep, can be larger if neglected</td>
<td>Deep often punched out due to pressure, also necrotic</td>
</tr>
<tr>
<td>WOUNDBED</td>
<td>Vascular classification varies between yellow and red wounds</td>
<td></td>
<td>Pale wound bed inclined to scab formation and necrosis. Manipulation causes no or little bleeding.</td>
<td>Inclined to high bacterial load. Pale wound bed</td>
</tr>
</tbody>
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CHRONIC LOWER LEG ULCERS A DIFFERENTIAL DIAGNOSIS

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<tr>
<td>VENOUS</td>
<td>Diffuse or irregular edges</td>
<td>Clearly demarcated</td>
<td>Clearly demarcated</td>
</tr>
<tr>
<td>ABPI</td>
<td>&gt; 0.8</td>
<td>0.6-0.8</td>
<td>&lt;0.6</td>
</tr>
<tr>
<td>PATIENT HISTORY</td>
<td>Usually history of deep vein thrombosis or varicose veins</td>
<td>Diabetic, inflammatory conditions associated with immuno-suppression Vasculitis</td>
<td>Absent ankle pulses, limb pain at night, pain improvement when limb hangs Smoking, diabetes can play a role Poor skin perfusion</td>
</tr>
<tr>
<td>TREATMENT OPTIONS</td>
<td>Moist wound healing according to tissue type and wound healing phase Compression Bandaging</td>
<td>Moist wound healing according to tissue type and wound healing phase</td>
<td>Moist wound healing according to tissue type and wound healing phase Referral to vascular surgeon.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Foot deformities, neuropathy, callosities, cold or hot temperature, atrophic nails, smoking, infection</td>
</tr>
</tbody>
</table>

CONCLUSION

Although chronic wounds still remain the most costly and probably most difficult wounds to treat, using a well-organised wound management programme is a prerequisite for optimum healing. By following the principles of wound healing one can provide the best care possible for our patients. Chronic lower leg ulcers remain a challenge. Healing these persistent ulcers will significantly improve the quality of life of the patients and reduce the enormous burden on the health care budget. By working together in a multi-disciplinary team approach we can provide the best health care to our patients and their families.