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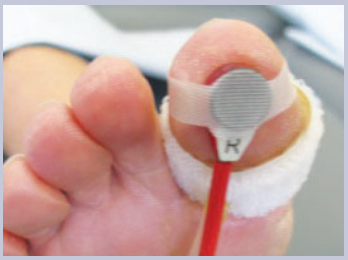
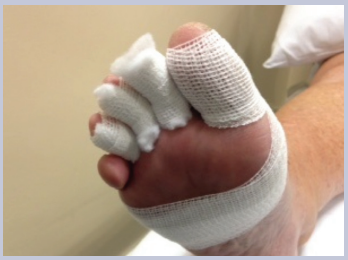
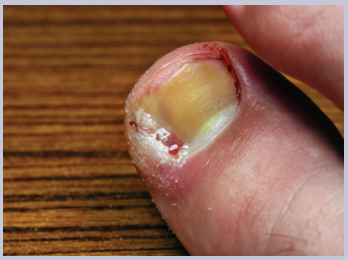
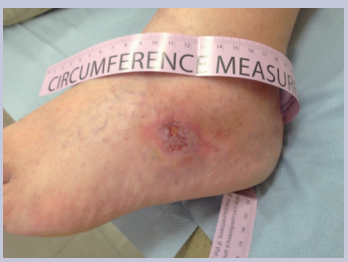
Wound Essentials

Providing wound care knowledge for the everyday clinician









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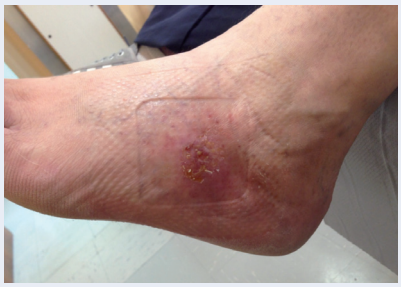

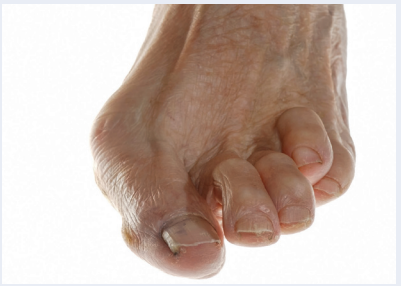

EDITORIAL

Elizabeth Nichols
Clinical Editor

Adam Bushby
Editor
adam.bushby@woundsgroup.com

Edda Hendry
Group Managing Editor

BUSINESS STAFF

Rob Yates
Publishing Director
rob.yates@woundsgroup.com

Paul Jones
Business Director
paul.jones@woundsgroup.com

Kathy Day
Publisher

Wounds Group
Unit 1.03 Enterprise House
1–2 Hatfields
London SE1 9PG
Tel: 0207 627 1510
www.wounds-uk.com
furtherinfo@wounds-uk.com

Subscriptions
Tel: 0207 627 1510 or
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For change of subscription address, call 0207 627 1510 or email furtherinfo@wounds-uk.com

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Editorial board

Farewells and new beginnings for *Wound Essentials*

ELIZABETH NICHOLS
Editor, Wound Essentials
Tissue Viability Nurse Specialist,
Your Healthcare CIC, Kingston, Surrey

Back in 2006, the first edition of *Wound Essentials* was launched. At the helm from its inception was Pauline Beldon, Tissue Viability Nurse Consultant. Her vision was to produce a wound care journal that would be accessible to clinicians of all disciplines who encounter wounds in their practice, but for whom tissue viability is not their primary remit.

There are many wound care journals in circulation, but most are aimed at specialist practitioners and can be challenging for non-specialists to understand and apply to practice. *Wound Essentials* prides itself on being written in jargon-free language, and in an easy-to-read style and always with a mind to being applicable to everyday practice.

This summer, Pauline retired after many years of working in the NHS and, in particular, in the field of tissue viability, and I am deeply honoured and delighted to be asked to take over her role as clinical editor of this journal. Her passion for tissue viability and commitment has been inspirational, especially her desire to empower others through training and education.

My hope is that this journal will continue to meet the needs of the everyday clinician who is seeking to prevent or manage wounds in whatever area of health care they work in. Wounds are no longer the sole remit of nurses — we all have a responsibility in promoting skin integrity in our patients, whatever our profession. And as our population ages, and the boundaries of surgery and medicine expand, we will all face increasing challenges in this area.

Over the coming year, the financial squeeze on the NHS is set to continue and tighten even further. There will be increased pressure to deliver wound care in ever more cost-effective ways. This will require clinicians to be knowledgeable and skilled in wound assessment and selection of appropriate dressings and equipment. *Wound Essentials* is one source of education that can support your continuing professional development and help to ensure you are equipped to meet the challenges of delivering safe, quality, and effective wound care.

With this in mind, we would love to hear from you with your thoughts and feedback on the journal and, in particular, with any topics you would like to see covered in future editions. This is your journal so please get in touch with your ideas. I hope you enjoy this issue, and find plenty to inform and shape your practice. WE

If you would like to contribute to a future issue of *Wound Essentials*, please contact the editor, Adam Bushby, via email:

adam.bushby@woundsgroup.com

Holistic management of patients with postoperative wounds and potential complications

Surgery is one of the most important treatments offered by today's NHS. As a result, the care delivered to patients in the pre-operative, intra-operative and postoperative stages form one of the cornerstones of nursing care. This article provides an overview of best practice and highlights the fundamental aspects of care delivery and focuses on the knowledge and skills required to successfully manage patients. Particular focus is given to the screening of high risk surgical patients to avoid postoperative wound complications, as well as the management of postoperative wounds.

"A multidisciplinary approach to postoperative care involving the surgical team is required to improve the overall management of surgical wounds."

JEANETTE MILNE
Tissue Viability Nurse Specialist, South Tyneside Foundation Trust, Hebburn

Surgery is one of the most important treatments offered by the NHS in the UK. Surgical staff and the resources they need to practice account for a substantial proportion of NHS activity and frontline care for patients. With continuing innovation, an increasing number of medical conditions are being remedied or managed using surgery.

In England alone, there are 4.6 million hospital admissions that lead to surgical care every year. Conservative estimates suggest that related costs in England amount to approximately £4.5 billion — 4.3% of the total NHS budget (The Royal College of Surgeons of England, 2012).

In the majority of cases, surgical intervention results in a break in the protective barrier of the skin. With the ongoing drive for shorter hospital stays and the increasing pressure to manage patients in a community setting, it is essential that staff managing patients have the knowledge and skills to enable them to do so effectively. This includes preparing patients for theatre in ways that reduce the risk of potential complications, as well as the ability to recognise early warning signs in order to minimise the impact of any complications that do occur. This article provides an overview of the key aspects of knowledge and skills required by clinicians to enable them to successfully manage patients with postoperative wounds.

Key guidelines and audit

A multidisciplinary approach to postoperative care involving the surgical team is required to improve the overall management of surgical wounds. Guidelines have been issued to help clinicians both

Table 1. Example audit sheet.

Observations					
Care action	**Patient 1**	**Patient 2**	**Patient 3**	**Patient 4**	**Patient 5**
1	Y	Y	N	Y	Y
2	N	Y	Y	Y	Y
3	Y	Y	Y	Y	N
4	N	N	Y	Y	Y
5	N	N	N	Y	Y
Total number of times an individual action was compliant	2	3	3	5	4

prevent and manage complications (National Institute of Health and Clinical Excellence (NICE), 2008). They highlight the importance of a thorough and structured approach to pre-, intra- and postoperative care.

This led to the development of a High Impact Intervention (HII) care bundle (Department of Health [DH], 2011), which is based on the NICE (2008) guidelines and expert advice. It comprises three phases of clinical actions which, if all elements are performed every time and for every patient, will reduce the risk of infection. However, the risk of infection increases when one or more actions of a care bundle are excluded or not performed (DH, 2011).

The use of this care bundle including regular audit of the actions taken and recording of any omissions in care during peer review should support cycles of continuous improvement. This will help users to deliver appropriate and high-quality patient care. It is recommended that compliance audits should be carried out regularly and the results recorded at the point of care (*Table 1*). In turn, results should be used in helping organisations to standardise patient care and support staff to challenge ritualistic and non-evidence based practice. The following section examines the elements of the care-bundle process.

Preoperative phase

Patients at higher risk of postoperative incisional complications may be identified using a comprehensive preoperative assessment. Factors increasing a patient's risk of wound-healing problems, such as wound dehiscence or blistering, include poor nutritional status; obesity; smoking/living with a smoker; and belonging to particular patient groups. These may include those with diabetes, rheumatoid arthritis and those taking steroids or immunosuppressant therapy. In addition, the type of surgery (e.g. bowel, planned/emergency), and the duration of the procedure, as well as any intraoperative complications encountered can also increase the risk of postoperative wound infection.

High Impact Intervention recommendations

HII recommendations for the preoperative phase are as follows:

- Screening and decolonisation: Patient has been screened for Methicillin-resistant *Staphylococcus aureus* (MRSA) using local guidelines. If positive, they have been decolonised according to the recommended protocol prior to surgery
- Preoperative showering: Patient has showered (or bathed/washed if unable to shower) preoperatively using soap
- Hair removal: If hair removal is required, it is removed using clippers with a disposable head (not by shaving) and timed as close to the operating procedure as possible.

Intraoperative phase

Operating staff are required to use an aseptic technique during surgical procedures and to prepare the skin at the surgical site immediately before incision using an antiseptic preparation. Surgical incisions anticipated to heal by primary intention should be covered by a film membrane, with or without a central absorbent pad (NICE, 2008). This should be left in place for 3–5 days, provided no adverse events occur (e.g. an unexplained increase in wound pain, pyrexia or sudden increase in wound exudate or odour).

High Impact Intervention recommendations

HII recommendations for the intraoperative phase are:

- Skin preparation: patient's skin

Table 2. Signs of infection of acute/surgical wounds (Cutting and White, 2004).

Primary closed wounds	Wounds healing by secondary intention (left open)
Abscess	Abscess/pus
Cellulitis	Heat
Discharge (serous exudate with inflammation, seropurulent, heamopurulent, pus)	Oedema
Delayed healing	Erythema
Discolouration	Cellulitis
Unexpected pain/tenderness	Discharge (serous exudate with inflammation, seropurulent, haemopurulent, pus)
Bridging of the epithelium or soft tissue	Delayed healing
Abnormal smell	Discolouration
Wound breakdown	Friable granulation tissue which bleeds easily
	Unexpected pain/tenderness
	Bridging of the epithelium or soft tissue
	Pocketing at the base of wound
	Abnormal smell

has been prepared with 2% chlorhexidine gluconate in 70% isopropyl alcohol solution (or povidone-iodine application if the patient has a sensitivity) and allowed to air dry

- Prophylactic antibiotics: appropriate antibiotics were administered within 60 minutes prior to incision and only repeated if there is excessive blood loss, a prolonged operation or during prosthetic surgery
- Normothermia: body temperature is maintained above 36°C in the perioperative period
- Incise drapes: if incise drapes are used, they are impregnated with an antiseptic
- Supplemented oxygen: Patients' haemoglobin saturation is maintained above 95% (or as high as possible if there is underlying respiratory insufficiency) in the intra and postoperative stages (recovery room)
- Glucose control: a glucose level of <11 mmol/litre has been maintained in diabetic patients (this tight blood glucose control is not yet considered relevant in non-diabetic patients).

Postoperative phase

During the postoperative phase, there are several steps to follow in relation to the use of Aseptic Non Touch Technique (ANTT), correct hand hygiene and the choice of surgical wound dressings:

- The wound is covered with an interactive dressing (i.e. one that promotes the wound healing process through the creation and maintenance of a local, warm, moist environment underneath the chosen dressing) at the end of surgery and while the wound is healing. The interactive wound

dressing is left undisturbed for a minimum of 48 hours after surgery unless there is leakage and the need for a dressing change

- A postoperative dressing should be removed earlier than the recommended 48 hours if there are clear signs of complications:
  - Signs of excessive inflammation which may suggest infection
  - Specific wound pain or pressure reported by the patient that is difficult to control with analgesia
  - Wound dehiscence can be described in two ways depending on the severity and depth of separation. Partial-thickness dehiscence involves the separation of the skin layers only, whereas full-thickness dehiscence involves both the skin and muscle layers, resulting in visualisation of underlying structures (e.g. major organs and/or bone)
  - Excessive exudate, strikethrough or leakage
  - Evidence of periwound skin stripping or blisters (may be indicated by pain on movement of the affected area (*Table 2*))
- The principles of ANTT must be used when the wound is redressed
- Sterile saline must be used for wound cleansing up to 48 hours after surgery
- Patients should be advised that they can shower safely 48 hours after surgery
- The use of topical antimicrobial agents is not recommended for surgical wounds that are healing by primary intention
- Hands must be decontaminated immediately before and after each episode of patient contact using the correct hand-hygiene technique.

Dressing choice

Dressing choice can significantly affect the outcome of postoperative wound healing and dressings should be chosen to optimise healing and minimise complications. Ideally, dressings should maintain a moist wound environment conducive to optimal healing, while avoiding maceration or blistering of the surrounding skin (Bhattacharyya et al, 2005; Cosker et al, 2005).

The choice of dressing depends on the wound type, position and size/depth. Other points to consider are the range of dressing sizes available, conformability and acceptability to the patient. Film and pad dressings are more conformable and have been reported to reduce blistering in some instances (Bhattacharyya et al, 2005; Cosker et al, 2005). Actilite Protect® (Advancis Medical), meanwhile, contains Activon Manuka Honey® and is an effective antimicrobial treatment that can be used on surgical wounds for preventing infection postoperatively.

Where possible, postoperative dressing choice should be aligned with NICE (2008) guidance or, where applicable, evidence-based guidelines. Low-adherent postoperative dressings or vapour-permeable polyurethane film dressings are usually used for uncomplicated surgical wounds with or without an incorporated, absorptive, central 'island' pad. Vapour-permeable film dressings offer a number of advantages over non-woven dressings (Roberts et al, 2011) in that they:

- Provide a barrier to extrinsic contamination
- Allow postoperative inspection of the periwound area (or inspection of the wound itself) without removal of the dressing in the first 48 hours
- Allow easy removal as a result of low adhesion to the wound
- Maintain a moist wound environment
- Enable the patient to shower after 48 hours without removal (i.e. they are waterproof)
- Can be left in place for up to 7 days
- Are conformable to body contours and tend to be more stretchy, allowing for postoperative movement/wearer comfort with reduced incidence of blistering.

When placing a dressing, careful consideration should be given to dressing orientation and tension, as well as how patient movement postoperatively may affect this. This can be a significant problem when dressing wounds are over joints where movement can result in skin damage and blistering as a result of shear (Leal and Kirby, 2008).

The author hypothesises that this occurs as a result of the use of non-stretch fabric dressings or overextension of any dressing material on application. Their post application renders them unable to accommodate the changes in shape and elasticity of the skin that occur as a result of normal postoperative oedema build-up.

In addition, patients are encouraged to mobilise after their operation to reduce the risk of complications, such as DVT, PE and pressure ulceration. If movement is hampered by dressing choice this will alter recovery times as their patient is less likely to move if they experience pain on movement, appropriate dressing choice can help minimise both pain on movement and also reduce the frequency of dressing changes. As a result, rather than allowing for the increase in volume, they remain fixed and when the patient moves, shear force subsequently strips or blisters the skin.

After the postoperative phase

The following recommendations apply to the initial postoperative phase (3-5 days) (DH, 2011):

- Continued use of ANTT for change and removal of dressings
- Keep the frequency of dressing

changes to a minimum to avoid disrupting healing tissue
- Use tap water for wound cleansing after 48 hours if the wound has separated or has been surgically opened to drain pus. Antiseptic agents are considered unnecessary for general wound cleansing but may be of value when irrigating an infected cavity wound
- Where periwound skin maceration occurs or is considered to be a risk (e.g. if an enteral fistula is present or if there are excessive exudate levels), consider skin barrier products
- Use an interactive dressing for surgical wounds healing by secondary intention (NICE, 2008). The dressing should be left in place for as long as indicated. Continual assessment ensures dressing changes are kept to a minimum
- Refer the patient to wound-care specialists if required for advice on dressings and care.

Patient education

Patients, carers and clinicians should be educated on optimal wound care. As a minimum, this should include how to identify a wound that is failing to heal and who to contact when concerned about a possible surgical site infection (SSI) (NICE, 2008). Where possible, this information should be reinforced with written materials.

These may include:
- A patient information sheet or leaflet, which helps to reinforce discussions about planned interventions with patients prior to the planned surgery to minimise risks postoperatively (e.g. smoking cessation, weight management)
- A postoperative patient education on diet/fluids, exercise/rest, medication, pain control, diabetes control, hygiene, etc. to reduce risks of infection and promote healing.

A good leaflet should also suggest when to contact healthcare professionals if concerned about possible infection.

Managing complications

If an SSI is suspected (i.e. cellulitis or a collection of pus with systemic complications such as sepsis), antibiotics may need to be considered (see *Table 2* for signs and symptoms and help with diagnosis). Intervention and release of pus must be a priority. Antibiotic choice should be based on the most likely causative organisms and patient allergy status, with consideration to local antibiotic resistance patterns and, when possible, the results of available microbiological culture and sensitivity tests.

An SSI can range from a spontaneously limited wound discharge, recognised usually within 7–10 days of an operation, to a life-threatening postoperative complication, such as abdominal wound dehiscence or a sternal infection with mediastinitis and dehiscence after open-heart surgery.

Article key points.

- Increased knowledge and skills are key to optimising patient outcomes
- Surgical site infection is largely preventable
- The key to identifying wound infection is to look for subtle signs
- Clinical indicators of infection require revision as knowledge advances
- Maximising patients' health pre-operatively where possible will help reduce risks of postoperative complications, including infection.

An SSI can have a considerable impact on a patient's quality of life, can carry a higher risk of morbidity and mortality, and can lead to a prolonged hospital stay (Coello et al, 2005) or rehospitalisation with greater use of healthcare resources and higher costs. Based on an SSI rate of 5%, NICE (2008) estimated each episode to cost £3500, and the overall cost of SSIs to the NHS to be around £700 million per year.

SSI is the most common postoperative incisional complication, with at least 5% of patients developing an SSI after a surgical procedure (NICE, 2008). Other complications include postoperative blistering and wound dehiscence, which may often be related to SSI and comprise approximately 20% of all healthcare associated infections (HCAIs).

To improve the onward management of complex surgical wounds, NICE (2008) suggests referral to a tissue viability nurse (or another healthcare professional with tissue viability expertise) for advice on appropriate dressings for surgical wounds that break down postoperatively or are electively left open to heal by secondary intention (e.g. pilonidal sinus). Negative pressure wound therapy (NPWT) may also be considered for more complex wounds such as abdominal wound dehiscence (World Union of Wound Healing Societies (WUWHS), 2008).

Most postoperative wounds will usually heal within 7–14 days depending on the type of surgery carried out. Despite best practice, some surgical wounds fail to heal primarily or are deliberately left open to heal by secondary intention. Several tools exist to optimise healing by secondary intention. Wound-bed preparation using the TIME (tissue, infection, moisture, edge) concept (Schultz

et al, 2003; Dowsett and Ayello 2004; Leaper at al, 2012), is an example of a practical tool for identifying barriers to healing and implementing a treatment plan to promote wound healing. Effective wound management will expedite and optimise healing.

Conclusion

This article highlights the significance of a multidisciplinary holistic approach to the care of patients undergoing surgical interventions. The importance and use of care bundles has been emphasised in an effort to minimise the impact of surgical wound complications. When complications occur, early recognition of signs and symptoms is essential in order to reduce the adverse effect on a patient's quality of life, as well as associated healthcare costs. Choice of dressing can significantly affect the outcome of healing in patients with postoperative incisions. A postoperative wound dressing should not be arbitrary, nor based solely on the initial cost of the dressing (Cosker et al, 2005). WE

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Choosing the most appropriate dressing: foams

Foam dressings have been common in the management of wounds since the 1970s. This article examines their use in wound healing, as well as in exudate management through foam's ability to hold fluid and transmit moisture vapour away from the wound through evaporation.

"As wound healing is physiological, patients need to be aware of the pivotal role they themselves play in the healing of their wound."

CAROL HEDGER
Tissue Viability Nurse Specialist, First Community Health and Care CIC, East Surrey, Caterham

Wound healing is a physiological process and is, therefore, dependent on an individual's overall health and wellbeing. A holistic assessment is an essential part of the nursing process to determine the cause of the wound and the interventions needed to aid the wound to heal. Clinicians do not heal wounds, patients do.

However, to create an efficient wound healing environment, patient education is key, for instance, explaining the use of dressings and other interventions, such as compression bandaging for a venous leg ulcer, or providing equipment to help reduce pressure when the individual has a pressure ulcer.

Dressings are a fundamental part of caring for a wound and with the plethora of dressings on the market, it makes choosing the appropriate one challenging for the clinician. A formulary is a helpful guide for selecting an appropriate dressing, if it also considers the costs and research associated with them.

Most community and hospital environments now provide a local formulary of dressings to aid choice. Wound care formularies will often contain advice about a dressing (what it is and what it is used for) in order for the clinician to make an informed decision.

Wound care company representatives often visit and inform clinicians about their products and why to use them but there should be clear clinical indications underlying the reason for use, alongside an expected outcome (i.e. absorbency).

According to the Wounds International Consensus Document entitled 'International Consensus: Optimising Wellbeing in People Living with a Wound' (Wounds International, 2012): 'The clinician is pivotal in optimising the wellbeing of people living with a wound, acting as the conduit between the patient, healthcare organisation and industry. Family members and carers should also be involved in this process.'

As wound healing is physiological, patients need to be aware of the pivotal role they themselves play in the healing of their wound. This

includes exercising, eating well, and maintaining good hygiene and skin care. Patients need to understand that dressings do not heal wounds, but that their body does. Changing the dressing type too frequently can lead the patient to believe that the nurse has not found the dressing that will heal the wound. Once educated, the patient will be better placed to understand the importance of selecting the appropriate dressing.

If a dressing has been chosen to address a particular problem within the wound, it should be used for a long enough period of time to achieve its objective, if there are no adverse effects.

There are many categories of dressings, such as:

- Alginates
- Antimicrobials
- Foams
- Honey
- Hydrocolloids
- Hydrofibers® (ConvaTec)
- Hydrogels.

Foams

Natural sea sponges were widely used in wound care as far back as the Middle Ages. They were used as absorbents, haemostats to control bleeding and for simple cleansing. Their popularity then declined in the 19th century as the organic material could not be sterilised and they adhered to the wound bed (Thomas, 2010).

The first foam product to be used in general wound management was silastic foam. It was introduced in the 1970s and used for cavity wounds. It was formed *in situ* from two liquid components, which were mixed at the bedside before being poured into the patient's wound where it formed in the shape of the cavity (Thomas, 2010).

What we understand to be 'modern foam dressings' also became widely available from the mid 1970s when they were introduced to manage light to heavily exuding wounds (Sussman, 2010). Foams are generally made from polyurethane that has been heat-treated to provide a smooth contact surface. They provide thermal insulation, do not shed fibres or particles, and are gas permeable (Thomas, 2010).

Foams are generally soft, pliable for conformability and have a low adherence. Their most important function is absorbency of exudate and the maintenance of a moist warm environment. They are made in various sizes and shapes, with or without an adhesive border (*Figure 1*).

Dressings without borders need to be secured by the use of a holding bandage applied appropriately or an adhesive tape. Dressings with borders adhere to skin and the patient's skin must be of a sufficient integrity to allow adherence without causing skin damage. The shaped dressings are generally bordered and designed to manage awkward sites on the body, such as the heel, elbow and sacral area. Most foam dressings come in sheets and there are some cavity dressings available. Foam dressings can be used as primary and secondary dressings.

Common examples of foams are:

- Biatain® (Coloplast)
- Allevyn® (Smith & Nephew)
- Lyofoam® (Mölnlycke Health Care)
- Mepilex® (Mölnlycke Health Care)
- Polymem (Medline)
- Trufoam® (Aspen Medical)
- Urgocell (Urgo)
- Aquacel® Foam (ConvaTec)

Many of the wound care product companies are now introducing foams with silicone across the dressing inclusive of border. This helps to prevent skin stripping by adhesives in people with fragile and sensitive skin. Foam dressings are also now available with silver, Hydrofiber and lipocolloids, and also with cleansing agents added.

***Figure 1.** (a) Examples of adhesive foam dressings. (b) Examples of non-adhesive foam dressings.*

Mode of action

The mode of action varies between different products and they are designed to take up exudate and keep it within the dressing, providing high absorbency and increased wear time. Foam dressings have different sized open cells that have the ability to draw exudate from the wound bed (Avent, 2010). The foam surface is generally smooth and hydrophilic, which means it attracts moisture (Pudner, 2001).

Foams soak up by vertical wicking by absorbing the exudate upwards and taking the shape of the wound to avoid macerating the surrounding skin. Some foams absorb laterally, which suggests exudate is absorbed into the whole of the dressing, rather than in areas in direct contact with the wound (Benbow, 2008). In this instance, there is a risk of skin maceration if the skin becomes protected.

Foams have the ability to retain fluid and transmit vapour away from the wound bed through the back of the dressing by evaporation (Adderley, 2008). Strikethrough of exudate can be observed through the top layer and when the exudate is visible and becomes within 2 cm of the edge of the dressing, this is an indication that it needs to be changed.

Clinical indications

The clinical indication for the use of a foam dressing is the presence and control of wound exudate. The absorbency is dependent on the dressing's presentation. The manufacturers will indicate on the label whether a dressing is suitable for light or heavily exuding wounds. The clinician must then choose a foam dressing that is suitable for the extent of exudate relating to the specific wound, as well as preventing maceration of the surrounding tissues. Foams are not suitable for dry necrotic wounds or dry epithelialising wounds (Beldon, 2012).

Foams can be left *in situ* for a maximum of 7 days and will need to be changed dependent on the level of exudate present.

Types of wounds

Foams are suitable for shallow wounds and there are some foam products suitable for cavity wounds. Foams are also suitable to cover wounds that have been lightly packed with a ribbon preparation.

Foams can be used on the following:

- Leg ulcers and under compression therapy
- Pressure ulcers
- Traumatic wounds
- Gastrostomy and tracheostomy wounds
- Minor burns
- Skin grafts
- Donor sites
- Diabetic ulcers
- All wounds where exudate presents.

Contraindications and considerations

Before using a foam dressing, address the following contraindications and considerations:

- Ensure the patient is assessed thoroughly to exclude any other reasons for increased exudate
- Foam dressings are not suitable for necrotic and dry wounds
- Be aware of the risk of macerated surrounding skin if foam is left on the wound too long or the incorrect product chosen to cope with the amount of exudate
- Consider using skin protection on the surrounding skin, such as Cavilon™ No Sting Barrier Film (3M) skin preparation to prevent maceration
- Check if the wound is infected or highly colonised as this will increase exudate from the wound. If the patient has systemic symptoms with a raised temperature antibiotics will be needed
- Use a foam with added antimicrobial to reduce bacterial content in an infected or highly colonised wound
- Contemplate a foam dressing with silicone added for patients with vulnerable skin
- Excessive exudate from a wound may have an underlying cause, such as oedema. Assess and treat the cause as this will influence exudate levels
- There is a risk of allergy in some patients. Be aware of demarcation lines on the skin where the dressing has been placed. Not all redness under foam dressings is due to an allergy; there may be other causes
- Foam dressings are not licensed as pressure relieving. Foams can be used to protect vulnerable skin, but if the skin is covered by a foam dressing it can hide any deterioration unless removed frequently for observation, especially in the case of pressure damage
- Hydrogels can be used under foam dressings, but as hydrogels comprise of a high percentage of water, they can cause maceration under the foam. Also the foam will absorb the hydrogel as it turns to water with the warmth of the body. A more viscous hydrogel or sheet hydrogel may be more suitable under a foam dressing.

Application

An effective process of application would be as follows:

- Before application, assess the periwound skin as a skin protector may be needed to protect vulnerable tissue
- Ensure the correct size is selected for application. The absorbent pad of the dressing should overlap the wound by approximately 2 cm
- Choose a dressing by the absorbency indicated by manufacturers and according to the amount of exudate from the wound
- Foam dressings can be cut to adapt to awkward areas of the body, but will need to be secured. Ensure the dressing is cut with a margin greater than the wound size
- Choose a foam with an appropriate adhesive border. If using an adhesive border, ensure the dressing can be left on for a long enough time period for the adhesive wear and stickiness to reduce with time so as to avoid skin stripping on removal. Removing adhesives daily will cause skin stripping
- Consider using a border with silicone for vulnerable fragile skin
- Removal of a foam dressing should be atraumatic, if the dressing is adhering to the wound there is not enough moisture and the wound needs to be reassessed
- The dressing can be left in place until the exudate strikethrough shows through the dressing and is 1–2 cm away from the edge of the absorbent part of the dressing

- Foam dressings are suitable to be left *in situ* for a minimum of 3 days and a maximum of 7 days. If they need to be changed daily, a more super absorbent dressing should be considered
- When removing bordered dressings, the clinician must be careful not to peel back the dressing, but instead stretch it on a horizontal plane away from the patient to break the seal of adhesive, or alternatively warm water should be used to remove
- The application of a foam dressing on overgranulation tissue can help to flatten this tissue, due to the pressure exerted by the foam's smooth surface onto the tissue (Harris and Rolstead, 1994).

Conclusion

Foam dressings are a popular and highly used dressing in the management of exuding wounds. They are generally well accepted by patients as they are comfortable to wear. However, it takes a skilled practitioner with a good knowledge of wound care products to assess a patient with a wound and provide the most appropriate dressing selection. Success is dependent on patients and their healing, as well as effective nursing assessment to identify cause and effect.

Choosing the appropriate dressing is always challenging for the clinician and understanding the actions and use of a range of dressings will help in achieving the best possible outcomes for patients. WE

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The importance of effective offloading and footwear for the diabetic foot

Chronic non-healing foot ulcers are a common problem associated with diabetes mellitus. Diabetic foot ulcers (DFUs) frequently occur on the plantar aspect of the foot at sites of high shear and pressure, primarily due to repetitive injury during daily activities. One of the mainstays of foot ulcer management is, therefore, effective redistribution and relief of pressure in order to prevent further tissue trauma and facilitate the healing process. This article highlights the importance of appropriate footwear for the primary and secondary prevention of foot ulcers while introducing the reader to a range of offloading devices that aim to facilitate the healing of established foot ulceration.

Diabetes-related foot ulceration is a serious complication of diabetes mellitus. Foot ulcers are associated with significant financial costs to health services and personal costs to those affected. Approximately 8% of all diabetes-related deaths are directly attributable to foot ulcers. Furthermore, diabetic foot ulcers (DFUs) are frequently associated with adverse outcomes, including limb and/or life threatening infection and lower extremity amputation (Bergin et al, 2013).

Clinical signs of neuropathy in the diabetic foot

The International Working Group on the Diabetic Foot (IWGDF, 2014) has reported that as many as 50% of people with diabetes will have significant peripheral neuropathy and 'at-risk' feet. The IWGDF defines diabetes-related peripheral neuropathy as: "The presence of signs or symptoms of peripheral nerve dysfunction in people with diabetes after exclusion of other causes" (IWGDF, 2014). Nerve dysfunction in diabetes can affect three different types of nerves in the lower legs and feet, namely the sensory nerves, motor nerves and autonomic nerves. This can give rise to a range of clinical signs and symptoms as discussed within *Table 1*.

Sensory neuropathy (loss of sensation) is a major risk factor for developing DFUs; approximately 45–60% of all DFUs are due to sensory neuropathy (Frykberg et al, 2006). Sensory neuropathy results in loss of protective sensation which can increase the risk of unnoticed trauma or injury to the foot from ill-fitting or inappropriate footwear. In fact, trauma from pressure, shear and/or friction from footwear is a leading cause of DFUs (Bergin, et al, 2013).

Approximately 50% of all DFUs occur on the plantar surface (sole)

"Diabetic foot ulcers are frequently associated with adverse outcomes, including limb and/or life threatening infection and lower extremity amputation."

CAROLINE McINTOSH
Professor of Podiatry, National University of Ireland Galway, Galway, Ireland

GREG HALFORD
Orthotist and Prosthetist, International Committee of the Red Cross

of the foot (Bus et al, 2011). *Figure 1* illustrates neuropathic foot ulceration on the plantar surface of the foot.

Motor neuropathy can give rise to significant foot deformities and increased levels of mechanical foot pressure which can contribute to tissue breakdown and foot ulceration. *Figure 2* shows an asymmetric presentation of deformity to the right foot. This patient had a history of ulceration and osteomyelitis (bone infection) which had contributed to the deformities presenting in his right foot.

A combination of autonomic neuropathy and sensory neuropathy is known to contribute to Charcot foot. Charcot foot has been described as the worst of the diabetic foot deformities (Lázaro-Martínez et al, 2014). It is a condition that can affect the bones, joints and soft tissues of the foot. In the initial stages, the foot becomes very inflamed and as the condition progresses, Charcot foot is characterised by bone destruction, dislocation and severe deformities of the foot (Rogers et al, 2011). *Figure 3* shows a Charcot foot presenting with severe deformity and plantar ulceration.

Plantar pressures

High plantar pressures in association with neuropathy have long been known to increase the risk of foot ulceration (Armstrong et al, 2001). Excessive pressure on the skin can lead to the development of hyperkeratosis, commonly called calluses (Lázaro-Martínez et al, 2014). The presence of calluses on the plantar aspect of the foot increases the risk of tissue breakdown and ulceration. In the insensate foot, elevated plantar pressure is a common cause of foot ulceration (Arts et al, 2012). *Figure 4* shows a computerised scan of the foot with the red areas highlighting sites of high plantar pressure.

Why offload?

Elevated plantar pressures are known to contribute to the development of foot ulceration. Furthermore, in the presence of an established foot ulcer, high plantar pressures can significantly delay healing. The central goal of any treatment programme designed to prevent primary and secondary episodes of foot ulceration, and heal active foot ulceration is effective pressure reduction (Armstrong et al, 2003).

When to prescribe footwear or offloading devices

When considering the prescription of therapeutic footwear and/or offloading devices, it is important to take into account the primary objective. A key question is: 'is the purpose for primary or secondary prevention or is the purpose to facilitate the healing of an established foot ulcer?'

Primary prevention

In primary prevention, the focus is on the prevention of foot problems. Primary prevention involves:

- Educating patients with regard to possible foot problems that can develop with diabetes. Also, education designed to empower individuals to look after their own feet, such as daily self-inspection and monitoring of any changes, is crucial in the prevention of problems
- Annual reviews by qualified healthcare professionals to include screening for peripheral neuropathy (nerve dysfunction) and peripheral arterial disease (poor blood supply to the legs and feet), and assessment for foot deformities (National Institute of Clinical Excellence [NICE], 2004)
- Footwear assessment and advice to prevent problems arising from ill-fitting or inappropriate footwear
- Advice on purchasing appropriate footwear (if appropriate)
- Appropriate footwear and insole prescription, if required, to protect and accommodate deformity as well as reduce dangerous peak plantar pressures. This is key to preventing future deformity (Rogers et al, 2011).

All healthcare professionals involved in the care of the diabetic foot can play a role in assessing footwear. *Table 2* outlines a simple checklist

Table 1. Signs and symptoms of diabetes-related peripheral neuropathy.

Type of neuropathy	Clinical signs	Clinical implications
Sensory neuropathy	Loss of sensation to light touch, pain and temperature.	Loss of pain significantly increases the risk of unnoticed injury or trauma that can lead to tissue breakdown and foot ulceration.
Motor neuropathy	Poor nerve supply to the muscles in the leg and the foot can cause foot deformities.	Foot deformities cause the foot to function abnormally. This can result in high areas of pressure on the foot that can lead to foot ulceration.
Autonomic neuropathy	Absence of sweating (anhidrosis) in the foot can cause dry skin.	Anhidrosis can lead to callus formation and skin fissures (cracks in the skin), which can increase the risk of infection and ulceration in the diabetic foot.

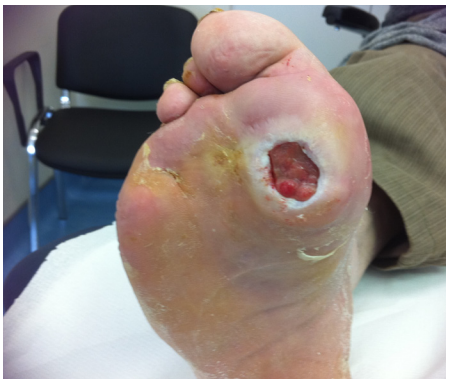

Figure 1. ***A neuropathic foot ulcer on the plantar surface of the foot.***

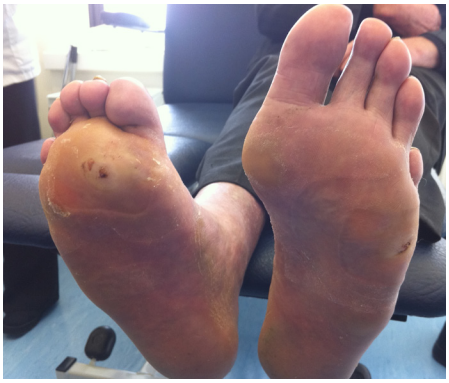

Figure 2. ***An asymmetric presentation of deformity to the right foot in a male with diabetes.***

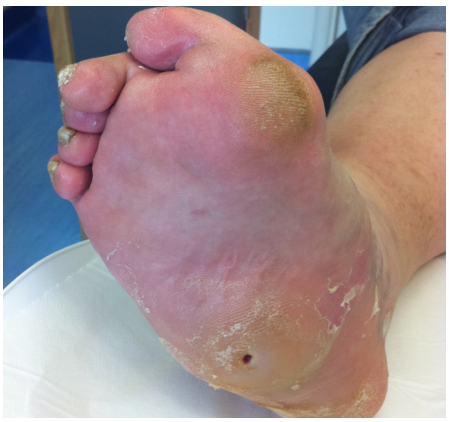

Figure 3. ***Charcot foot showing severe deformity and plantar***

for healthcare professionals, based on the principles of ask, look and feel. When any of the criteria listed within *Table 2* are not fully acceptable then a referral should be made to the podiatrist/specialist team for further assessment.

The acute foot

Managing the acute foot involves the care of people with foot care emergencies and foot ulcers. NICE (2004) defines a foot care emergency as new ulceration, swelling or discolouration. In these instances, a referral must be made to the multidisciplinary foot care team within 24 hours.

NICE guidelines expect that the multidisciplinary team, as a minimum, will:

- Investigate and treat vascular insufficiency
- Initiate and supervise wound management
- Use dressings and debridement as indicated
- Manage infection appropriately
- Ensure an effective means of distributing foot pressures, including specialist footwear, orthotics and casts
- Try to achieve optimal glucose levels and control of risk factors for cardiovascular disease.

Within its guidelines, NICE (2004) advocates assessment of the foot by a specialist team. Offloading devices that reduce peak plantar pressure and redistribute pressure from the site of the ulceration are critical to positive patient outcomes and wound healing in patients with acute foot problems.

Secondary prevention

Once healing is achieved, the focus of secondary prevention is to prevent further episodes of tissue breakdown and foot ulceration. Unfortunately, the rate of recurrence in patients with a history of DFUs is high (Peters et al, 2007). Patients with a history of foot ulceration should, therefore, be considered at high risk of future foot complications and management plans should be implemented that focus on the prevention of further problems (NICE, 2004). Such plans should include ongoing foot health education, regular podiatry assessment and intervention, as appropriate, as well as footwear advice and assessment.

Therapeutic footwear for primary and secondary prevention

Therapeutic footwear has been shown to have a beneficial effect in the primary and secondary prevention of DFUs (Maciejewski et al, 2004). Furthermore, patients who routinely wear therapeutic footwear and orthoses are less likely to develop ulcer recurrence. Indeed, Tyrell and Carter (2008) reported the findings of a study that found that diabetic patients who wore their therapeutic footwear for more than 60% of the daytime reduced ulcer recurrence by more than 50%.

Therapeutic footwear aims to redistribute plantar pressures across the foot, thus reducing high pressures in at-risk areas (Owings et al, 2009). Effective therapeutic footwear has many benefits for the individual including improved mobility, comfort and protection, and an improved quality of life and sense of wellbeing (Tyrell

Figure 4. ***A scan of the foot illustrating high areas of pressure in red.***

and Carter, 2008). However, clinical effectiveness is heavily dependent on acceptability and actual use of the therapeutic footwear (Boulton and Jude, 2004).

Assessment for therapeutic footwear

Individuals presenting with foot complications associated with diabetes require rapid access to specialist multidisciplinary diabetes teams. This will enable the team to undertake appropriate assessments and initiate timely management strategies. Podiatrists and orthotists, as part of the specialist multidisciplinary team, will routinely assess the foot for the presence of deformities or structural anomalies, and assess the patient's need for therapeutic footwear.

Tyrell and Carter (2008) described three different types of therapeutic footwear:

- Stock orthopaedic — off the shelf
- Modular orthopaedic — minor modifications to stock orthopaedic shoes. Specific footwear modifications can be prescribed by the orthotist or podiatrist to prevent unwanted movements of the foot and ankle
- Full bespoke — made specifically for the patient. Bespoke footwear is generally prescribed to individuals with unusual foot shapes/severe deformities, for instance, in the case of Charcot foot.

Ultimately, regardless of the specific type, therapeutic footwear should:

- Protect the foot from injury to the skin that can result from the absence of protective sensation
- Protect the foot from deformity (or from further deformity), particularly for those with Charcot changes
- Protect the foot from external damage. Toes must always be enclosed and the sole should be firm enough to stop foreign bodies piercing it.

Table 2. Checklist for healthcare professionals involved in the assessment of footwear.

Ask	Is the footwear being used? Is the footwear comfortable? It is important to appreciate that in the presence of sensory neuropathy, the patient may not be able to feel discomfort or pain. Is the footwear easy to get on and off independently?
Look	**Observe the feet. Are there any:** Signs of pressure? Signs of damage? Signs of deformity? Signs of change over time? Signs of poor hygiene? **Assess the footwear:** Is there wear on the sole (especially on the lateral [outside border] heel) as this can wedge or tip the foot? Does it accommodate any foot deformity? Is there less than expected wear? This is a sign of poor compliance Does it provide a firm, snug fit? Can fastenings be donned firmly to prevent foot sliding?
Feel	**Feel inside the shoe. Check for:** Foreign bodies Excessive moisture Soft lining — is it intact throughout with seams flat and hidden? **Check the outside of the shoe:** Is there appropriate width and depth at the toes, metatarsal heads (ball of the foot), mid foot and heel? Is it an appropriate length? Check by palpating toes in standing.

The overall mechanical function of therapeutic footwear is to reduce plantar pressure over at risk/vulnerable sites, or previously ulcerated sites, on the foot by transferring the load across the foot. For instance, significant reductions in pressure over the forefoot can be achieved with shoes that have a modified sole known as rocker bottom sole and with footwear that include orthoses (Bus et al, 2008).

Offloading devices for acute foot problems

DFUs are frequently located on weight bearing areas of the foot. Hence, relieving pressure (offloading) on the ulcerated area is absolutely crucial in the treatment of a DFU. Treatment strategies for DFUs must, therefore, include adequate offloading of the affected area of the foot (Bus et al, 2009). Achieving adequate pressure relief will prevent further trauma and facilitate wound healing (Frykberg et al, 2006). There are a number of offloading modalities available for the management of DFUs ranging from simple insoles and orthotic devices through to total contact casts (TCCs). Offloading devices for DFU should aim to reduce pressure at the area of the wound by redistributing pressure across other areas of the foot (within safe limits).

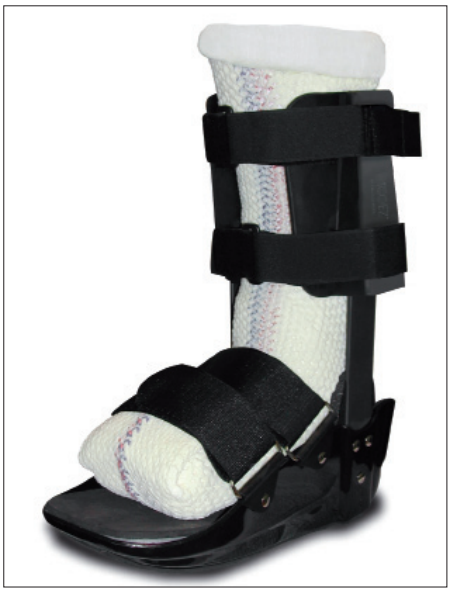

Figure 5. ***TCC-EZ® (Derma Sciences)***

The initial assessment for, and application of, offloading devices must be conducted by a skilled practitioner, for instance, a podiatrist or an orthotist. If pressure is transferred inappropriately, and above safe limits, this could give rise to further tissue damage and new episodes of ulceration.

Offloading devices range from irremovable devices, such as the TCC, to a range of removable devices that can be applied and removed at home.

Irremovable and removable devices

The TCC is an irremovable plaster or fibreglass cast that can be applied by a specialist team. TCCs are considered to be the gold standard in offloading DFUs after randomised control trials found 84–92% pressure reduction at the site of ulceration (Armstrong et al, 2005). An example would be the TCC-EZ® (Derma Sciences), which offers a one-piece, roll-on woven device that simplifies the application process while reducing the potential for causing additional tissue damage (*Figure 5*).

However, because these devices are irremovable their use is contraindicated in the presence of infection or vascular compromise (NICE, 2004) and alternative strategies that allow regular visual examination of a DFU should be considered. Furthermore, casting requires a skilled practitioner specifically trained in the technique and can be costly and time intensive in terms of application, removal and reapplications (Bus et al, 2009).

There are a number of removable devices that are available to offload DFUs (as detailed in *Table 3*).

Selection and use of an appropriate offloading device

Ideally, podiatrists and orthotists should work together to identify the most appropriate device. Offloading must be achieved in a timely way to facilitate wound healing. Other members of the multidisciplinary team have a role to play supporting compliance and reinforcing education about correct application and use.

Patient-centred care and concordance

Tyrell and Carter (2008) highlighted that dissatisfaction with the cosmetic appearance of therapeutic footwear is a constant theme in the literature. Knowles and Boulton (1996) reported poor patient concordance with therapeutic footwear in a diabetic population with only 22% of patients admitting they regularly wore the prescribed footwear. It is, therefore, important to implement a patient-centred approach when considering therapeutic footwear as a management strategy.

A key aspect that must be addressed is patients' choice of footwear, their perceptions of specific types of footwear, and criteria that are significant specifically to them. Without this there will be limited success in finding footwear to meet the needs of the patient in terms of acceptability and style (Tyrell and Carter, 2008). There is limited benefit in referring a patient for a

Table 3. Examples of removable offloading devices.

Examples of removable walkers	Examples of temporary shoes
Pneumatic walker/air cast boot An example of a Controlled Ankle Motion (CAM) walker; the air cast boot consists of inflatable sections in the inner aspect of the boot that hold the foot and ankle in position hence immobilising movement. There is total contact with the plantar aspect of the foot and a rocker bottom sole, thus the boot works by reducing areas of high pressure and redistributing pressure across the foot.	**Temporary footwear with offloading insole** Temporary footwear can be employed as a short term measure to manage DFUs. The insole is a useful layered insole that allows a clinician to remove plugs of material for targeted offloading. The advantage with such a device is that it can be rapidly tailored to the patient at the chair side.
Pressure Relieving Ankle Foot Orthosis (PRAFO) The PRAFO is a device that relives unwanted pressure from the heel area in ambulation (walking) or on lying down. Essentially, the design of the PRAFO removes all pressure from the heel and redistributes pressure across the rest of the foot. This device is ideal for ulcers located on the heel.	**Wedge shoe** Wedge shoes can be employed as a temporary measure to facilitate wound healing. Wedge shoes can be used to offload the forefoot by preventing the forefoot from making contact with the ground, thus transferring pressure across to the rearfoot.

footwear assessment, or prescribing therapeutic footwear if they will not be worn.

Poor patient concordance is also an issue with regards to offloading devices. The main disadvantage of removable devices is that they can be removed by the patient. Armstrong et al (2003) explored activity patterns of patients with DFUs and found that patients prescribed removable devices used these devices for fewer steps each day when compared to irremovable devices. In devices that are irremovable, such as the TCC, this is not an issue and this probably explains why the TCC has been found to be more effective than other offloading strategies.

Conclusion

Effective therapeutic footwear can play a significant role in the primary and secondary prevention of DFU, particularly in patients with sensory neuropathy. Therapeutic footwear can have many positive effects; for the individual this can include better mobility and an improved quality of life and sense of wellbeing. However, the clinical effectiveness of therapeutic footwear is dependent on acceptability by the patient and actual use of the footwear.

In the acute foot, offloading devices are crucial to facilitate wound healing, but again, concordance with these devices can be an issue. The multidisciplinary team must adopt a patient-centred approach towards therapeutic footwear and offloading devices to increase the likelihood of patient concordance and ultimately improve patient outcomes. WE

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Juxta CURES™: when is it appropriate?

Compression therapy is the optimum treatment for venous leg ulcers (Nelson, 2011). Through case study evidence, this article challenges the view that the current 'gold standard' bandaging technique is the most clinically or cost-effective treatment and suggests that Juxta CURES™ (medi UK) could be used as a first-line approach for compression therapy. The application of therapeutic compression bandaging is difficult and requires specialist knowledge and skill. Many practitioners fail to apply bandages in an effective, competent manner. Using an innovative compression therapy system could eliminate the difficulties experienced with traditional compression methods due to its ease of application and ability to apply and sustain accurate compression at the desired level.

"It is well documented that compression therapy of one type or another is generally the optimum treatment for the vast majority of legs ulcers, most of which are venous in origin."

GWEN LAWRENCE
Vascular Specialist Nurse, Wirral University Teaching Hospital NHS Foundation Trust, Wirral

Between 1% and 2% of the UK population are said to be affected by leg ulcers (Graham et al, 2003). Posnett and Franks (2007) equated this to mean that at any given time between 70,000 and 190,000 individuals have an open ulcer. More women than men are affected and prevalence increases with age. Not only do patients suffer pain and restricted mobility, they are psychologically affected by altered body image. Many patients live in social isolation because of the embarrassment and discomfort of wearing wet, malodourous bandages, with frequency of dressing change at the behest of a health professional.

It is well documented that compression therapy of one type or another is generally the optimum treatment for the vast majority of legs ulcers, most of which are venous in origin. Research demonstrates that 80% of leg ulcers have a venous component and that more ulcers heal with compression than without (Nelson, 2011). However, sometimes patients with leg ulcers are found to have both venous and arterial disease; these are mixed aetiology ulcers and quite often compression therapy at a reduced level can be safely used to treat these (Royal College of Nursing, 2006).

It is simply a matter of initially establishing the cause and type of the ulcer. There are numerous excellent journal articles that, along with clinical experience, will enable the novice to become proficient in the assessment of both the patient and the ulcer (Morison and Moffatt, 2004; Anderson, 2013).

Once the aetiology of the ulcer has been diagnosed, the next factor is to decide upon the most appropriate level of compression to use and then, finally, choosing the most suitable system for applying the compression, of which there are several. Examples include long- and short-stretch

bandages, two-layer bandage systems, compression stockings and ulcer hosiery kits, intermittent pneumatic compression.

There are of course exceptions, where compression therapy is not appropriate, such as arterial insufficiency. This is when the arterial blood supply is so reduced that any form of compression therapy could result in tissue damage, sometimes severe enough even to lead to amputation. Therefore, patients with arterial ulcers should not have compression therapy irrespective of the choice of system used. Contraindications to compression also apply when patients have acute cellulitis, unstable cardiac failure and acute deep-vein thrombosis.

This article will focus on one innovative system used to apply compression therapy, which is called Juxta CURES.

Juxta CURES

Juxta CURES™ (medi UK) is a compression system that is suitable for almost all patients for whom compression is considered beneficial. Additionally, due to its simplicity of application, it allows patients the opportunity to be directly involved in their clinical treatment and care, should they wish to be. Unlike compression stocking ulcer systems, which only allow for compression at a set level, Juxta CURES is adjustable and can provide an accurate range of compression from 20–40mmHg. Simply expressed, it can provide full or reduced compression therapy in keeping with patient requirement.

Juxta CURES is suitable for use on most patients who require compression therapy, although recent literature would suggest it should be considered when encountering particular problems and mainly aimed at complex cases (Lawrence, 2014). It was also suggested in an article by Bianchi et al (2013) that Juxta CURES can be considered a solution when patients have been non-compliant with compression bandages.

Juxta CURES is adaptable and could be considered for any patient requiring 'full' or 'reduced' compression when, routinely, compression bandages may be considered the first-line choice. This article aims to provide insight into a much more routine use of JuxtaCURES — simply using it as an alternative to the more traditional original Charing Cross four-layer bandaging regimen, often considered the 'gold standard' compression system, but not necessarily the most clinically or cost effective (Ashby et al, 2014).

The VenUS IV study by Ashby et al (2014) focused on using compression at a level of 40 mmHg, which general consensus recommends as the required level of compression at the ankle to reduce venous hypertension (Clark, 2003). However, bandages are difficult to apply and to maintain compression at an exact level. Application of compression bandaging requires specialist skill.

Vowden (2010) stated: "A number of factors, such as practitioner's knowledge and skill, the limb shape and the materials used, as well as patient acceptance influence the application of effective compression." A literature review estimated that many practitioners are failing to apply bandages in an effective, competent manner (Todd, 2011). This has the potential to result in non-therapeutic compression which, at best, is ineffective with ulcers failing to heal and, at worst, has the potential for causing harm. It may be possible that Juxta CURES could eliminate this problem as it is simple and relatively quick to apply accurate compression at the desired level, whether it is at 40 mmHg, 30 mmHg or 20 mmHg. But first a brief outline of why compression therapy helps to heal ulcers.

Compression therapy

The venous system of the lower limbs consists of an interconnected network of superficial veins, perforator veins and deep veins. Venous leg ulcers occur, when the blood returning from the veins in the legs to the heart is slow or obstructed (O'Meara et al, 2009). The blood in the leg veins is pushed upwards partly by the action of the foot and by the calf muscle pump as the leg moves (Lindsay et al, 2003). One-way valves within the veins stop the blood flowing back down the veins again when the muscle relaxes (Tortora and Grabowski, 2000). However, damaged valves cannot prevent backflow of venous blood and reduced mobility and limited movement will add to the problem. It is this backflow of blood that results in extra blood volume, causing raised pressure known as venous hypertension, which is the main cause of venous ulceration.

Many patients have associated oedema and episodic ankle oedema is a common feature of superficial venous disease. Oedema that extends beyond the ankle suggests deep

$$P = \frac{T \times N \times K}{CM \times W}$$

T = Tension at which the bandage is applied (usually 50% stretch)

P = Pressure

N = Number of layers of bandage (two in a spiral application)

K = a mathematical formula; a constant value

CM = Circumference of the limb

W = Width of the bandage

(Thomas 2003)

***Figure 1.* Principles of Laplace's Law.**

Figure 2. ***Juxta CURES (medi UK).***

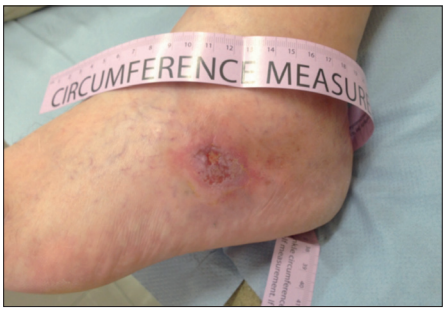

Figure 3. ***Week 1 — commencement of compression therapy.***

venous disease. Compression therapy squeezes the veins making the valves more likely to close and this increases venous blood flow. Compression is usually graduated, such that the magnitude is greatest at the ankle and gaiter area and diminishes towards the knee (Scottish Intercollegiate Guidelines Network, 2010). The term 'graduated compression' refers to a 20–30% reduction in pressure from the ankle to below knee and is thought to aid venous return to the heart, and occurs naturally when compression is applied to a limb of normal proportions due to the principles of Laplace's Law (*Figure 1*)(Thomas, 2003; World Union of Wound Healing Societies, 2008). Graduated compression also reduces venous reflux and ankle oedema and increases venous blood flow, thus improving the microcirculation and encouraging the healing process (Rajendran et al, 2007).

With proven superficial venous disease and an absence of deep vein disease, once the ulcer has healed, surgical treatment of varicose veins is known to reduce subsequent ulcer recurrence and should be offered to patients (Barwell et al 2004; Gohel et al, 2007).

JuxtaCURES – How does it work?

Juxta CURES consists of a legging, anklet and liner and a Built-in Pressure System™ (BPS™; medi UK) guide card (*Figure 2*). These components are used in conjunction to form a bespoke system and provide a measurable level of compression. Juxta CURES will accommodate virtually any size leg as it comes in three lengths: short (28 cm), standard (33 cm) and long (38 cm). It can also fit limbs with a very wide circumference, although where chronic oedema/lymphoedema is the primary condition, an alternative system called Juxta-FIT™ (medi UK) may be more appropriate. This is because Juxta-FIT is made from an inelastic material specifically for high working pressure and works in a similar way to short-stretch bandages (Mullings, 2012).

Ankle circumference, in conjunction with the BPS guide card, is used to measure the amount of compression to apply. The BPS measures the amount of stretch in a compression garment wrapped around a limb of known circumference, the pressure applied to the limb can be predicted. The greater the tension applied to the garment, the further it stretches and greater compression is applied to the limb. To establish which Juxta CURES length is required, one simple measurement is taken from the ankle to just below the popliteal fossa, following the contour of the limb.

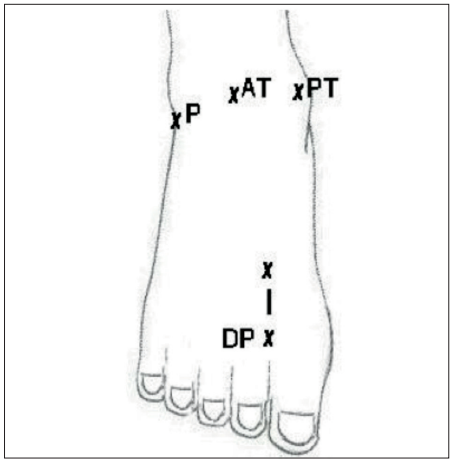

Figure 4. ***Locating pedal pulses.***

When first initiating the use of Juxta CURES, the healthcare professional will need to measure and adapt the garment to fit the patient's leg, but following instruction, many patients are able to apply the product for themselves.

Case study

Peter (not the patient's real name) is a 48-year-old man who suffered a burn to his left foot as a 15-year-old. In May 2014, he developed a non-healing wound over the site of the original burn. Initially, his GP referred him to a Consultant Dermatologist who saw him in September. Following clinical examination, the ulcer was described as 'very painful' and measuring 2.5 cm x 2 cm within an area of atrophie blanche and obvious visible varicosities. Venous stasis was diagnosed and compression therapy recommended following doppler assessment (*Figure 3*). Before applying compression therapy it is important to assess arterial supply ensure it is safe practice. Pedal pulses can be palpated using the finger tips, but palpation of pulses alone is not adequate to rule out peripheral arterial disease (*Figure 4*).

Measurement of the ankle brachial pressure index (ABPI) of both lower limbs by handheld Doppler device is the most reliable way to detect arterial insufficiency (Scottish Intercollegiate Guidelines Network, 2010). Interestingly, Doppler assessment proved unhelpful as the patient had an elevated ABPI of 1.5, higher than the widely considered normal range of 0.91–1.3.

It is generally accepted that an ABPI higher than 1.3 may be associated with arterial incompressibility at the ankle and calcification of the arterial wall (Al-Qaisi et al, 2009). Therefore,

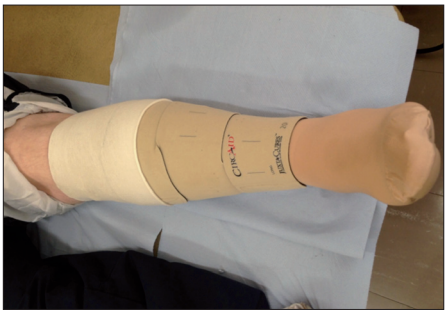

Figure 5. ***Patient wearing Juxta CURES.***

Peter was referred to a Vascular Consultant for further assessment. A duplex scan was arranged and it demonstrated all arteries were widely patent, but confirmed the presence of calcification in the popliteal, posterior tibial and anterior tibial arteries. These results meant it would be safe to use compression therapy.

Standard four-layer compression would usually be suitable, but Peter is driver by profession and he was not permitted to drive if his leg and foot were bandaged. Therefore, Juxta CURES was considered a suitable alternative. Of course a compression hosiery ulcer kit could have been considered, but Peter is 6ft 2in, has long legs and wears size 12 shoes, and compression hosiery ulcer kits will not accommodate his foot and leg size or shape. Juxta CURES was ideal because of its wide size range. He was fitted with a size large and instructed how to apply and adjust it, when to wear it and also how and when to change his dressing (*Figure 5*).

The dressing used was UrgoTul Absorb Border (Urgo Medical), 13 x 13 cm, because the dressing needed to be secured for ease of anklet application (*Figure 6*). Dressing removal had already proved painful for Peter so a dressing with a silicone adhesive was ideal to try and make removal as painless and atraumatic as possible. The dressing also has the benefit of being composed of a lipidocolloid soft contact layer next to the ulcer and a foam layer attached to aid exudate absorbency.

Peter was reviewed in clinic 1 week after commencement of compression therapy with Juxta CURES. This was primarily to check that the Juxta CURES was fitting correctly and that he was managing his dressings and application, which he was. Peter had very little associated oedema in his leg at the start of his treatment and, therefore, the Juxta CURES only needed a slight adjustment. One month after starting treatment, Peter was pleased to see the ulcer responding to treatment and healing well (*Figure 7*).

At the time of writing the ulcer has not yet completely healed, but once it has, Peter should be measured and provided with class 2 RAL standard compression hosiery to reduce the risk of recurrence. He should also be considered as a candidate for surgery. Following full vascular assessment, NICE guidance (2013) recommends surgical intervention for varicose veins if appropriate following the healing of a venous ulcer.

Conclusion

JuxtaCURES is already considered an alternative system for applying compression. It has been well documented as an ideal compression system to help with issues such as misshapen limbs or those who find it difficult to adhere to compression bandages (Lawrence, 2014). However, Juxta CURES is suitable for any patient requiring compression therapy including those with associated oedema, who often find compression bandages painful.

When oedema is an associated issue, the Juxta CURES will need regular adjustment in the first few days as it quickly and efficiently reduces the oedema level. Patients can be as involved as much or as little as they

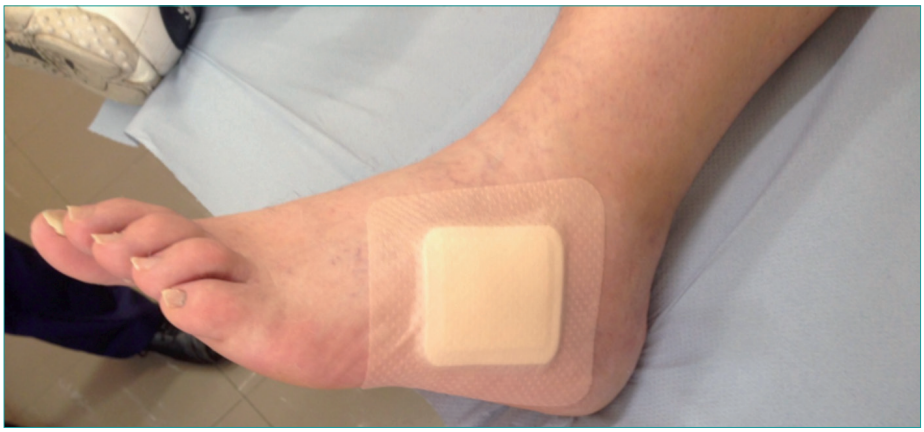

Figure 6. ***Ulcer dressed with UrgoTul Absorb Border (Urgo Medical).***

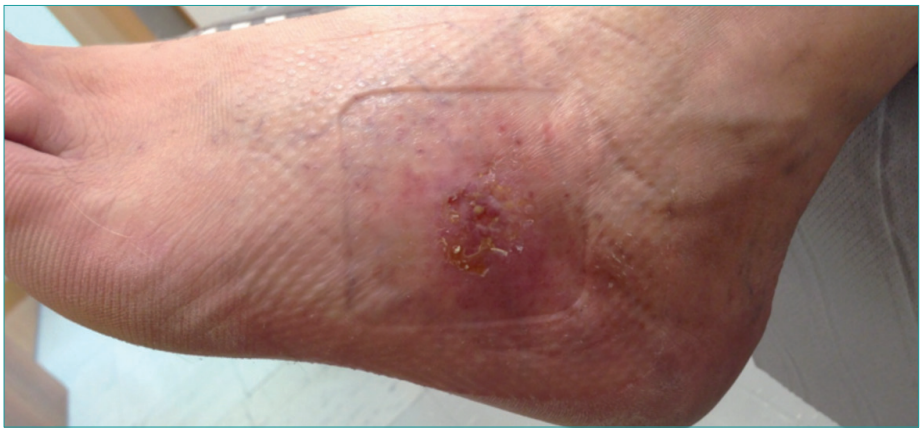

Figure 7. ***Ulcer at week four of treatment.***

choose and Juxta CURES is quick to apply, reduces dressing time and has the potential to reduce the overall cost of compression therapy for almost all patients.

Lastly, Juxta CURES can overcome the disadvantage of using bulky bandages that prevent many patients from wearing their usual footwear and restrict ankle movement. Presumably, most patients would rather wear regular shoes and healthcare professionals should encourage patients to maintain as much mobility as possible because this is essential for the foot and calf muscle pump to work efficiently (Anderson, 2006). To quote the World Union of Wound Healing Societies (2009), there is a myth that "compression therapy for venous ulceration has to be delivered using a bandage". Perhaps now is the time to challenge this myth and consider Juxta CURES a viable first-line alternative. WE

Declaration of interest

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Ten top tips for toe bandaging for chronic oedema/lymphoedema

Toe bandaging is often seen as complicated and potentially dangerous, but with the right training and guidance this article sets out to underline the potential benefits, including controlling swelling in the toes and reducing the risk of infection.

"Compression bandaging is known to reduce capillary filtration by increasing the pressure in the subcutaneous tissues and preventing fluid from entering the interstitial spaces."

REBECCA ELWELL
Macmillan Lymphoedema Nurse Specialist, University Hospitals of North Midlands

Chronic oedema is estimated to affect 3.99 people per 1,000 of the UK population, rising to 10.31 per 1,000 people aged 65–74 and again to 28.57 per 1,000 people aged 85 or above (Moffatt et al, 2012). There are many causes of chronic oedema, but they largely fall into four main categories: lymphoedema (both primary and secondary), lipoedema, dependency oedema, and lymphovenous or phlebolymphoedema (Green and Mason, 2006).

Toe bandaging is an accepted part of multi layer lymphoedema bandaging (MLLB) (International Lymphoedema Framework [ILF], 2006) and its use in venous hypertension has been reported by McCann (2008). Toe swelling can be a natural occurrence in chronic oedema, but can also be induced by incorrectly applied compression bandaging that leaves the toes and often the forefoot free of compression.

Both Todd et al (2003) and McCann (2008) questioned whether toe bandaging may actually prevent toe ulceration in patients requiring lower-limb compression bandaging for venous leg ulceration. This followed an article by Chan et al (2001) who analysed 194 patients attending a leg ulcer clinic and found that after receiving bandage treatment, 12 patients had developed toe ulceration.

Toe swelling, if not managed, can lead to bacterial and fungal infections, which, in turn, can develop into cellulitis or skin breakdown. Toe bandaging will reduce the risk of infection.

Compression bandaging is known to reduce capillary filtration by increasing the pressure in the subcutaneous tissues and preventing fluid from entering the interstitial spaces (European Wound Management Association, 2006). This process, however, must be ongoing so if it is initially achieved with bandaging it will need to be continued with compression hosiery. Compression combined with exercise increases lymph flow and venous return, thus reducing the volume of oedema. In addition, it increases the blood flow into the microcirculation, which may improve wound healing and help soften thickened or 'woody' tissues.

LaPlace's law is an accepted mathematical equation that states compression applied to a limb can be increased by:

- The tension applied to the bandage
- The size of the limb
- The number of layers applied
- The width of the bandage.

As the toes are the smallest circumference of the limb, it is essential they are considered when applying

compression bandaging to the lower limb if oedema is present.

Before commencing toe bandaging, as with all types of compression, vascular assessment should be carried out to exclude occult arterial disease (Clinical Resource Efficiency Support Team, 1998). This may include: Doppler/ankle brachial pressure index assessment, pulse oximetry or toe pressures/toe brachial pressure index. Clinical signs and symptoms should also be recorded, e.g. colour/temperature change and comorbidities, referral on to a tissue viability nurse specialist/leg ulcer nurse specialist or vascular surgeon may be necessary before commencing any form of compression.

Particular attention should also be given to those patients with peripheral neuropathy – e.g. with diabetes – who may not be able to detect if the toe bandages are causing friction or trauma. In these instances, toe bandaging should only be used if the patient can be closely monitored. Older individuals with impaired mobility should also be carefully considered for suitability to toe bandaging because if the toe bandaging is causing pain or discomfort, they may not be able to remove the bandages independently.

Standard technique for toe bandaging

1. With a 4 cm elastic conforming bandage (i.e. Mollelast, Activa) start with one turn around the foot at the base of the toes
2. Start to bandage the great toe starting at the base of the nail. Go around the toe, moving downwards with each turn of the bandage until the toe is fully covered with no gaps for oedema to accumulate (the number of turns will depend on the size of the toe). Leaving the toenails and tip of the toes free ensures the toes can be observed for any colour change
3. The bandage must be kept flat at all times. Anchor again around the foot with no tension
4. Start to bandage the second toe, again staring at the base of the nail, repeat all steps until all of the toes except the fifth and smallest toe is reached. This digit is generally not bandaged as it is usually unaffected by oedema
5. The ball of the foot should be completely free of bandage cover.

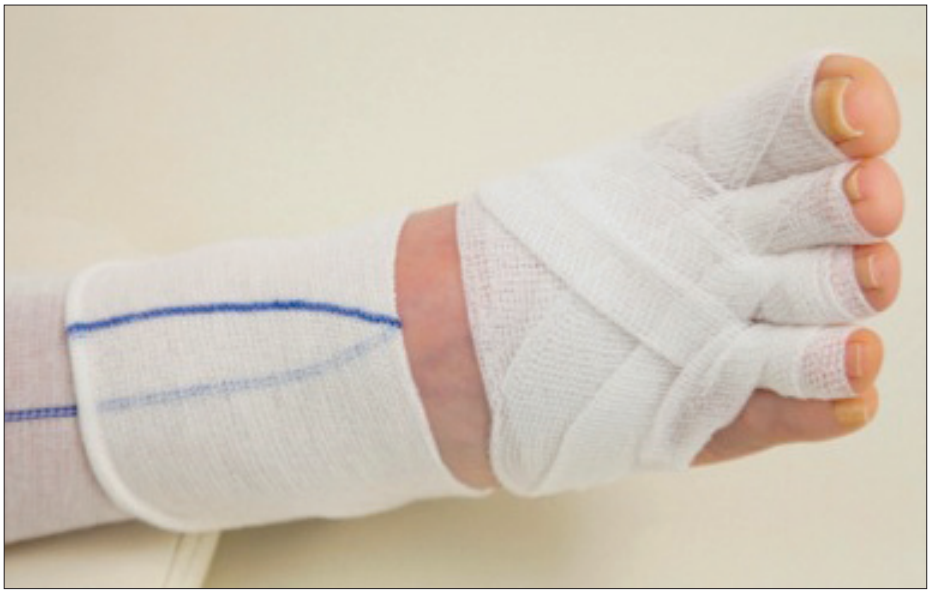

***Figure 1. Standard toe bandaging* in situ.**

This article provides ten top tips to help provide effective toe bandaging for individuals with chronic oedema or lymphoedema.

1 BANDAGE WIDTH – TO FOLD OR NOT TO FOLD?

As previously stated, bandage width affects the compression; a 4 cm elastic conforming bandage applied flat will provide less compression than a 6 cm retention bandage, which is folded in half when applied to the toes only. When anchoring the bandage around the foot, the bandage must be flattened out to its full width to reduce the number of layers around the base of the toes, which could affect the direction of lymphatic and vascular drainage. If the toes are significantly swollen, or have skin changes, it may be desirable to use a folded bandage to increase the compression, however, this technique requires practice. The clinician also needs to be aware that if the bandage is folded, this will increase the layers applied to the digit.

Figure 2. Demonstration of folding the bandage when applying toe bandaging.

2 BANDAGES APPLICATION DIRECTION

It is particularly important to remember the positioning of the feet and toes, and how important the feet and toes are for balance. If applied inappropriately, toes can easily be malaligned by compression bandaging and this can affect a person's gait and possibly induce pain. Compression should not impede function or overall mobility (ILF, 2012). Almost all of the information on toe bandaging states that bandaging should start at the great toe, however, it will depend on whether the person applying the bandage is right or left handed and

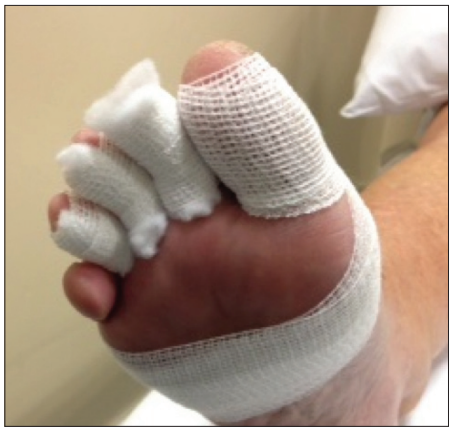

Figure 3. Demonstration of padding with undercast wadding when to the underside of the toes.

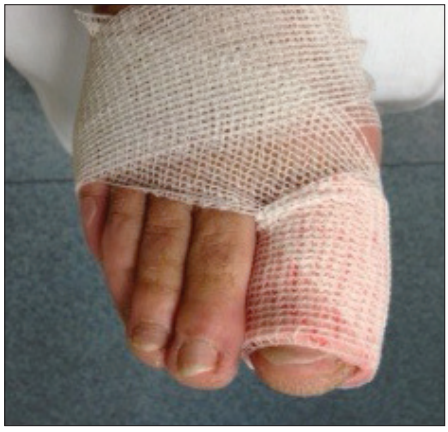

Figure 4. Polymem toe dressing **in situ** *under toe bandaging.*

which foot the bandage is being applied to (e.g. a right-handed application to a right foot will find it easier to start at the great toe, but on the left foot it is more natural to start at the fourth toe).

3 PROTECTION

Not everyone has flat, straight toes and this can be problematic with toe bandaging. King (2007) stated that creases or fissures should be filled with foam, but this can be bulky and fiddly, it is much easier to use folded undercast wadding, e.g. Cellona (Activa) or Coban™ (3M) foam cut to shape. These pieces can be reused daily (as long as they are not soiled) and are just secured underneath the toe with the toe bandage as it is applied.

4 TENSION

Bandages are neater when applied with tension, but in toe bandaging it is essential that no tension is applied to the base of the toes when anchoring the bandage and, indeed, there should be minimal tension applied to the toes themselves. As previously stated, the tension applied using LaPlace's law increases compression, due to the small circumference of the toes (even when swollen) this must be considered. It is extremely important that the applied toe bandage does not lift the toes up unnaturally. Patients should have full toe flexion and movement; patients should be encouraged to wriggle their toes when the toe bandage has been applied, and they will quickly inform the clinician if it feels restricted or not. The toe bandage should be removed and reapplied if it is too tight.

5 PAPILOMATOSIS/SKIN CHANGES

The toes are common places for papillomatosis to appear. These are benign skin growths of epithelial tissue that may contain fibrous vascular outgrowths. These areas tend to be hyperkeratotic and have a fur-like appearance. Due to their surface vascular supply, the villi may bleed easily if disturbed. They can make toe bandaging more challenging as they often lead to shape deformity. In these instances, a protective layer may be used under the toe bandage (e.g. Cellona or for further protection PolyMem® [Aspen Medical]) toe dressings, which come in various sizes and also have a silver version. In palliative cases, these dressings can be used on their own (the toe end can be cut to make a toe sleeve, rather than full cover). Any other skin conditions, e.g. tinae pedis/fungal nail infection, should be treated immediately to prevent the risk of cellulitis. Fungal nail infections can be transferred to the skin, but are difficult to distinguish from psoriasis of the nail and, therefore, nail clippings should be sent for testing before treatment is commenced. Topical treatments are less effective than systemic therapy, but there are significant side effects that must be considered on an individual basis.

6 LYMPHORRHOEA

In patients with lymphorrhoea (leakage) from the toes, it may be necessary to use a super absorbent dressing. Some of these can be pleated or fanned to fit in between the toes, similar to weaving, in order for the toe bandages to then be applied over this (Hardy, 2010).

7 INCREASING THE COMPRESSION

In extremely swollen or thickened toes where the compression needs to be increased further than just folding the retention bandage in half, reduced stretch fabrics can be used (e.g. Coban 2.5 cm). This small width bandage can either be applied on the roll or cut into strips to make it easier to go between the toes. The tape bandage should be applied from the base of the nail of each toe, working down to cover the whole toe and then cutting off at the bottom of each toe, rub lightly to secure. This can provide increased stiffness and thus higher compression, it can be a useful technique if only one or two toes are affected. This should only be applied by specialist nurse or else under the direction and supervision of a specialist nurse.

8 TOE GLOVES UNDER BANDAGES

Toe gloves can be an effective way of protecting toes from oedema being forced into them during compression therapy or it can be used as an alternative where toe bandaging is problematic. This may occur when the technique has been tried and failed (e.g. patient choice, pain, or lack of confidence/training with the toe bandaging technique). A number of toe caps/gloves on the market are off the shelf in standard sizes and on prescription (e.g. Microfine toe cap, Haddenham, which is a light and silky toe cap that can be cut to fit without fraying, providing great versatility and reducing bulk to the forefoot).

Other toe caps are made to measure and in a flat knit thicker fabric. These are effective, but may take time to obtain.

9 SHAPE DEFORMITY

Limb shape distortion requires adaption of the application of compression materials (ILF, 2012). When individual toe bandaging is not possible — e.g. due to the extent of the dorsum overhang in a patient with spina bifida — conventional bandaging alone would not address the most troublesome area of swelling. In this instance, a stump bandaging technique may be used. The toes would be combined with the forefoot, padding would be applied over a cotton liner and then the compression bandage can either be pleated back and forth across the 'stump' to cover the whole area or individual strips of short stretch cohesive bandage (Actico®, Activa Healthcare) can be used and then secured in place with a spiral application. This technique can facilitate rapid volume reduction to allow standard toe bandaging to be used, once distortion has reduced.

10 'FALLING OFF'

As toe bandaging is usually done with a retention or elastic conforming bandage, with little tension, it is inevitable that toe bandages fall off easily. This can be distressing for the patient who should be made aware that this can and often does happen, and is not a cause for concern. Toe bandages will simply be reapplied at the next compression application.

Discussion

Toe bandaging is often seen as complicated and potentially dangerous. If wrongly applied it can cause excoriation, constriction, splaying of the fifth toe due to more pressure over fifth metatarsal region, as well as pain due to cracks on the plantar side of toes (ILF, 2012). Any bandage applied incorrectly, or inappropriately, can cause damage and, therefore, should never be applied without appropriate training and education and the necessary competency. The advice of a Tissue Viability Nurse/leg ulcer specialist should be sought if the clinician requires training in this skill.

There are many excellent training images available online for toe bandaging, including videos from Activa Healthcare and Abertawe Bro Morgannwg University Health Board.

Conclusion

Toe bandaging is an excellent way to control and reduce swelling of the toes. It can help improve skin changes (e.g. papillomatosis and lymphorrhoea) and reduce the risk of bacterial and fungal infections. Due to the fact that toe bandaging may reduce the risk of toe swelling and possibly ulceration it should be considered for any patient undergoing compression bandaging of the lower limb(s). Once mastered, the technique can be easy to apply and is extremely cost effective. WE

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Figure 5. Haddenham Healthcare Microfine toe cap (cut to fit).

Figure 6. Stump bandaging using Actico (Activa Healthcare) short-stretch cohesive bandages.

Doppler assessment: getting it right

Full leg ulcer assessments are important in order to identify the aetiology of patients' leg ulcer and Doppler ultrasounds form a part of this. Doppler assessment training is an integral part of any leg ulcer management course that all nurses who care for patients with leg ulcers should attend. However, it has been noted that incorrect Doppler readings still occur within practice. This article discusses some of the practices that can affect Doppler readings, thereby helping nurses to improve their Doppler assessments.

"Determining the aetiology of the ulcer is key to ensuring the correct treatment protocol is followed — inappropriate treatment, at best, would mean ineffective care and, at worst, harm to the patient."

NICOLA WHAYMAN
Independent Leg Ulcer Specialist Nurse, National Leg Ulcer Forum Committee Member

Leg ulcers are non-healing wounds on the lower leg that have been present for at least 4–6 weeks (Moffatt et al, 2007). They affect approximately 1% of the UK population (Callam et al, 1985). Leg ulcers are more common among older people (Morris and Sander, 2007) and, with an ageing population, this is going to increase (Douglas, 2001). With 80% of all leg ulcers being treated within the community (Cornwall et al, 1986) and the majority of the assessment and care being delivered by nurses (Moffatt et al, 2007), it is essential that community nurses have the understanding and skills to effectively assess and manage patients with leg ulcers.

Full leg ulcer assessments

Undertaking a full leg ulcer assessment is a necessary skill in that it enables the clinician to gain sufficient knowledge about the patient in order to correctly determine the cause of the ulcer and identify any factors that may delay healing. Nurses need to have knowledge and understanding of the lower limb circulatory system, theories of how ulcers develop and awareness of unusual causes (Moffatt et al, 2007). Determining the aetiology of the ulcer is key to ensuring the correct treatment protocol is followed. Inappropriate treatment, at best, would mean ineffective care and, at worst, harm to the patient.

Doppler assessment

The Doppler ultrasound assessment and ankle brachial pressure index (ABPI) play only part of the assessment process and cannot be relied on alone to provide an accurate diagnosis. The Doppler is a tool for assessing arterial disease in the lower leg and any deviation in the process will produce variables that affect the results obtained (Worboys, 2006).

Nurses need to be educated in both the theory and practice of leg ulcer assessment so that their knowledge, skill and competency allow them to effectively carry them out. However, even with the requisite training and education, inconsistencies are still observed, leading to incorrect Doppler results.

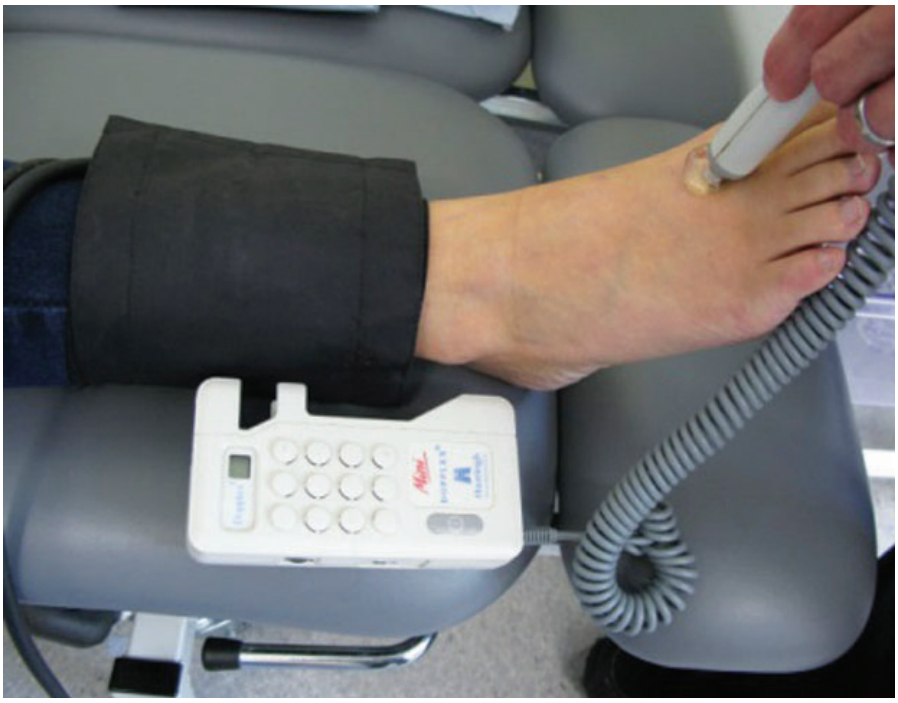

Figure 1. ***The cuff should be positioned over the ankle area to obtain the ABPI.***

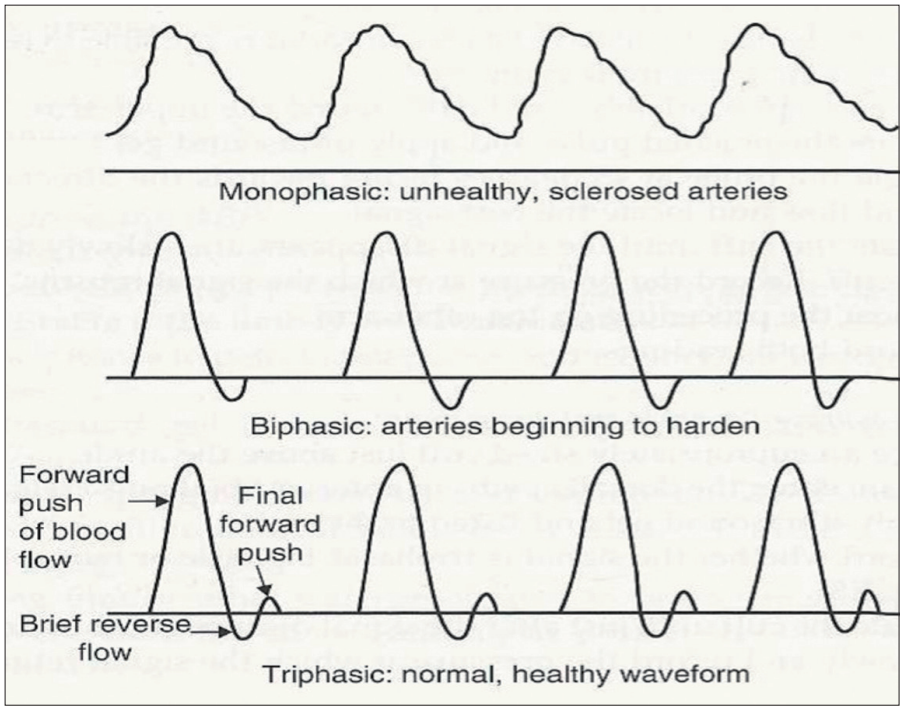

Figure 2. ***Pulse sounds.***

The procedure for obtaining an ABPI through the Doppler assessment has already been well documented (Worboys, 2006). Therefore, this article focuses on the factors that may affect the readings. It must be noted that the procedure must first be explained to the patient clearly in order for informed consent to be obtained.

Resting the patient

The patient needs to rest quietly for 10–20 minutes in order to obtain a resting systolic pressure and nursing staff must make sure that they factor in this time within the patient's appointment slot. With frequent time pressures within the workplace, this part is often rushed. Moffatt et al (2007), therefore, offers two time-saving tips:

- Nurses may either ask the patient to rest for half an hour before the district-nurse visit, or arrive half an hour earlier to the clinic/practice-nurse appointment so they can rest quietly in the waiting room
- Or, alternatively, as the patient is lying down resting, nurses can start the assessment.

Lying flat

The patient needs to lie as flat as possible to reduce hydrostatic pressure inaccuracies (Moffatt et al, 2007). If the patient cannot lie flat, nurses can bring their legs as near to heart level as possible and document this position so that colleagues are aware, allowing consistency for future readings. If patients are not lying flat, readings will be falsely high (Moffatt et al, 2007). Therefore, staff need to be aware of this.

Cuff size

Nurses must make sure the appropriate sized cuff is used as the wrong size will lead to inaccurate pressures. A cuff that is too short or too narrow results in overestimating pressures and a cuff that is too big will underestimate pressures (Moffatt et al, 2007). When applying the cuff to the leg, nurses should ensure it is positioned over the ankle area (*Figure 1*) to attain the ABPI; further up the leg will result in a calf brachial pressure index, which is incorrect.

Repeatedly inflating the cuff should also be avoided as reinflating it before it has been fully deflated may alter pressures (Moffatt et al, 2007). The cuff then needs to be slowly deflated until it makes a sound. If the cuff is deflated too quickly, the initial sound may be missed, particularly in patients with irregular heartbeats, and will therefore provide a false reading (Worboys, 2006).

Brachial systolic pressure must be attained from both arms (unless there is a medical reason why

this cannot happen). The highest measurement should be used for the test as having the nearest measurement to the central systolic pressure improves the accuracy (Moffatt et al, 2007).

Probe

The probe should be held at a 45° angle to the arm pointing towards the heart and slowly moved around until the nurse can locate the pulse. Pressing too hard can cause the vessel to compress and no sound will be heard. A continuous 'whoosh' sound that can be heard is the venous system and not the vessel that is required. It is important to become familiar with the different arterial sounds and to make a note of them; this is often missed out during assessments, but is really important for knowing the state of the vessels you are listening to.

Triphasic is the sound of a healthy artery (three distinct beats are heard), biphasic sounds (two beats) are often heard in the older person as a result of the normal physiological process of ageing, monophasic sounds (single beat, often muffled and dull) indicate that the vessel is diseased (Worboys, 2006; *Figure 2*).

There are two sizes of probes:

- 8 MHz is the standard probe for use on normal limbs
- 5 MHz is a probe that can give better results for oedematous ankles and feet where sounds can often be distorted due to tissue fluid.

Foot pulses

Having knowledge of the anatomy of the foot will help in locating the four foot pulses (*Figure 3*). Two pulses need to be used for each leg; however, the anterior tibial and the dorsal pedis are part of the same artery and, therefore, should not both be used. One of these pulses

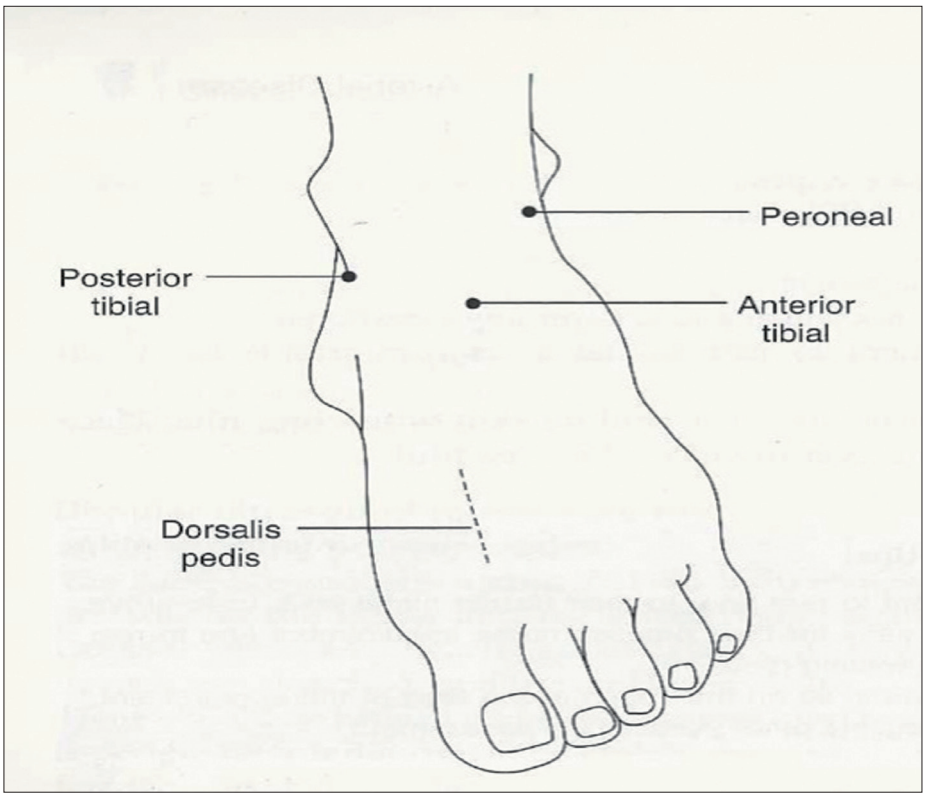

Figure 3. ***Four foot pulses.***

Table 1. Ankle brachial pressure index (ABPI) results (Moffatt, 2007).

ABPI score	Interpreting ABPI score
ABPI < 0.5:	Excision with adequate margins — followed by direct closure, skin-grafting or reconstructive surgery.
ABPI 0.5–0.9	Moderate-to-severe peripheral arterial disease. Refer to the leg ulcer specialist/tissue viability nurse and/or vascular team. Some may reduce compression, but only under specialist guidance.
ABPI 1.0–1.3	Normal ABPI high compression is probably safe in the absence of other contraindications.
ABPI > 1.3	May indicate false high readings, especially if pulse sounds are monophasic. Ankle vessels may be non-compressible, indicating severe calcification, which is more commonly seen in people with diabetes. Falsely high readings may be a result of poor Doppler procedure and this needs to be reviewed by a specialist nurse. Toe pressure may need to be assessed.

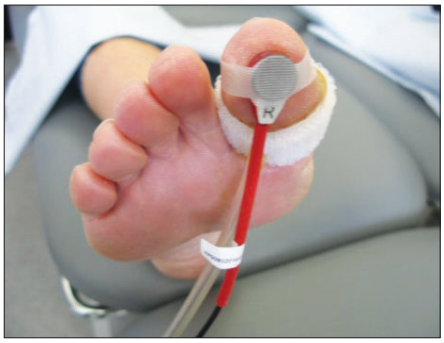

Figure 4. Machine for taking TBPI.

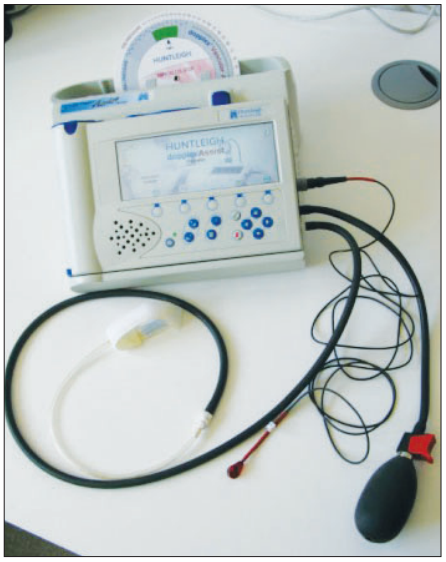

Figure 5. TBPI taken with hand-held Doppler and appropriate sized cuff.

should be used alongside either the posterior tibial pulse or peroneal pulse. Again, a reading should be taken from both legs in order to attain a picture of the person's whole arterial system, with the highest foot pulse in each leg being used for the measurement.

Calculating the ABPI

To calculate the ABPI, the highest foot reading on the right foot should be taken and divided by the highest brachial reading. Then, the same should be done for the left foot, taking the highest left-foot reading and dividing it by the highest brachial reading. This will then give you an ABPI for the major vessels for the right and left leg.

Nurses should always refer to their local policy for interpreting results as policies may differ on values. However, a general guide to interpreting the ABPI readings can be seen in *Table 1*. ABPI must always be interpreted by a qualified health professional within the context of the local policy and full leg ulcer assessment, using all information gained through assessment and Doppler results (Moffatt et al, 2007). For example, the accuracy of the procedure, the pressures obtained, variations in pressure, and the quality and type of pulse sounds heard must all be considered alongside the rest of the information obtained from the leg ulcer assessment.

As noted, the health professional must not only be a qualified nurse, but must also have further education and training in leg ulcer assessment and management (Royal College of Nursing (RCN), 2006; Scottish Intercollegiate Guidelines Network (SIGN), 2010).

Documentation

The entire assessment should be documented and held within the patient's records, whether in paper form or uploaded to electronic records. This allows other health professionals to access the assessment. Simply writing the ABPI results in the notes does not constitute good record-keeping practice as this does not consider the whole assessment and the ABPI is meaningless as a stand-alone assessment.

Table 2. Toe brachial pressure index (TBPI) results (Moffatt et al, 2007).

TBPI scores	Interpreting TBPI results
TBPI >0.7	Normal/satisfactory peripheral arterial supply.
TBPI<0.65	Indicative of peripheral arterial disease. Refer patient to the vascular team for further investigation.

Further tools to aid assessment

There are other tools that can be useful in leg ulcer assessments. Trained nurses need to be aware of these and find out if they have access to them.

Toe pressure

Doppler ultrasound can also be used for measuring toe pressures — useful when there have been false high ABPI readings, owing to calcification, which rarely affects the toe arteries. It is also helpful when there is pain and discomfort preventing ABPI measurements or if there is gross oedema in the lower leg/foot.

The most common way to take a toe brachial pressure index (TBPI) is using a Vascular Assist® (Huntleigh) machine (*Figure 4*). However, TBPI can also be taken with an appropriate sized cuff (*Figure 5*) and a handheld Doppler. The comparison is then made between the brachial and toe pressures, which are measured in the same way — toe pressure divided by the highest brachial pressure.

Toe pressures are normally smaller than brachial pressures. The ratios are lower owing to the size of the arteries. Therefore, it is important to interpret the readings differently (Moffatt, 2007; *Table 2*). Again, this forms only part of a full leg ulcer assessment. All information

must be considered and training must take place before using this procedure.

Pulse oximetry

Another useful tool is pulse oximetry, which can help with the assessment of peripheral arterial perfusion. It is easy to use, as the health professional only has to place it on a finger or toe, rather than locating the arteries, and it is proving to be an accurate, non-invasive tool (Moffatt et al, 2007).

The pulse oximeter measures oxygen levels within the tissue and the signal is diminished when blood flow is occluded. The procedure is similar to that used with the Doppler. The pulse oximeter is placed on the finger or toe and the cuff is placed around the arm or ankle, depending on which reading is being taken. There is, however, a change to how the cuff is inflated and it is necessary to have training on this method if it is favoured. Once again, the calculation used is the toe reading divided by the highest finger reading. Interpretations are similar to those for the ABPI, but appropriate training is required to do this.

Tissue viability/leg ulcer specialist

It is important to know when to seek further help and advice from local tissue viability and/or leg ulcer services. They can offer support to community/practice nurses and review complex patients. Clinicians should be aware of local protocols, and know how and when to refer to these services, as well as when it is necessary to refer to vascular teams within secondary care. There are national guidelines (RCN, 2006; SIGN, 2010), as well as best-practice documents available (i.e. Compression in Venous Leg Ulcers: A Consensus Document [2008]). The importance of training, keeping skills up to date and knowing when to seek advice cannot be overstated. The national Leg Ulcer Forum, Leg Clubs and Tissue Viability Society are other useful sources of information alongside books and journals.

"The importance of training, keeping skills up to date and knowing when to seek advice cannot be overstated."

Conclusion

This article has highlighted the importance of full leg ulcer assessments, of which Doppler assessments play only a part, being carried out by trained, competent nurses. Consideration has been given to some areas of the Doppler assessment that can alter ABPI results if not carried out correctly. Other tools that can aid the assessment process have also been examined, as well as the important role of tissue viability and leg ulcer services in supporting nurses out in the community. WE

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Ten top tips for everyday foot-care conundrums

The population of the UK is around 64 million and the average person takes between 7,000–13,000 steps per day (Tudor-Locke et al, 2011). In a typical lifetime, our feet will take us more than 4 times around the circumference of the planet. It is perhaps little wonder that 20% of adults are reported to have experienced foot pain within the past month and 60% within the past 6 months (Garrow et al, 2004). Being able to identify, treat and educate patients about the most common foot problems is key to keeping them ambulatory and, in the 'at risk' populous, preventing disaster. The conditions discussed in this article are most often the usual culprits of patient complaints.

This article outlines ten tips to aid the clinician in terms of overcoming everyday foot care problems. It is not a panacea, but aims to assist clinicians in developing a basic working knowledge of common conditions encountered in podiatric clinical practice.

1 Corns and calluses

Corns and calluses are formed within the epidermis as a result of mechanical or chemical stress on the skin and are part of the body's protective mechanism. Growth factor is released throughout the layers as a reaction to the stresses exerted on it, hyper-proliferation, increased adhesion proteins and a reduced desquamation rate occur (Kim et al, 2010).

A centralised area of pressure may produce a para-keratinised nucleus, known as a corn. As a callus thickens, the dermal pressure increases and the problem becomes cyclical; especially if in a confined space such as a shoe. If the pressure is sufficient to compress the small arterioles that service the skin, tissue hypoxia and aseptic necrosis may occur.

Treatment

Gentle filing with an emery board or foot file may be of benefit, whereas caustics or grater type devices are not recommended. All patients — except those with hyperhidrosis — will benefit from twice daily emollient application. It should be noted that aqueous creams are not advocated as moisturisers. Local NHS podiatry services may be able to offer pain-free debridement or corn enucleation using a scalpel (*Figure 1*).

2 Ingrown and thickened toe nails

Ingrown nails are referred to as onychcryptosis. Ingrown toe nails are usually a triangular spike that has grown forward due to improper nail cutting, as a result of tight foot wear/hosiery that compress the sulcus (the fleshy part next to the nail) or blunt trauma; all of which cause the nail to hide beneath the sulcus, dig in to and pierce the flesh. The body then attempts to heal, however, the nail prevents this, causing hypergranulation

"Being able to identify, treat and educate patients about the most common foot problems is key to keeping them ambulatory and, in the 'at risk' populous, preventing disaster."

KARL GUTTORMSEN
Advanced Podiatrist, Pennine Acute Hospitals NHS Trust, Manchester

PAUL CHADWICK
Consultant Podiatrist, Salford Royal NHS Foundation Trust

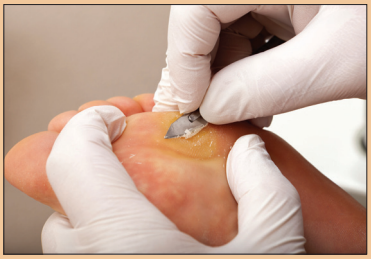

Figure 1. Callus.

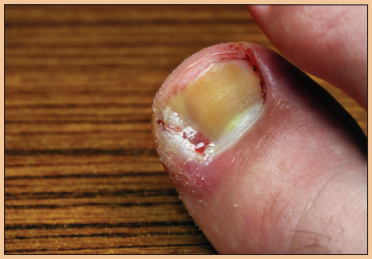

Figure 2. Ingrown nail.

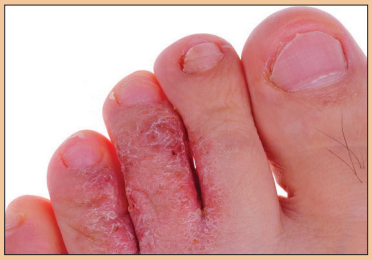

Figure 3. Tinea pedis.

that is highly vascular and may cause distress (*Figure 2*).

Treatment

In small children, ingrown nails can usually be managed conservatively by cutting the nail spike out and massaging the sulci down and away from the nail, while filing in a horse shoe motion at the edge to round any spikes. The nail should be grown out slightly, filing the edges as described and cutting the nail straight across, not following the curved shape as would normally be advised with a healthy nail.

In adults and children alike, if the condition cannot be managed conservatively, individuals should be referred to podiatry/GP for nail surgery. Often, only part of the nail needs to be removed (partial nail avulsion) and is aesthetically preferable to removing the whole nail (total nail avulsion). Patients present after they have been given several ineffective courses of antibiotics. Early referral can prevent unnecessary prescriptions for this patient group. Thickened nails or onychgryphosis are common and occur as a result of trauma or stress to the part of the foot that produces the nail (germinal matrix). When the matrix is damaged, this causes hyperproliferation. Increasing pressure on the structures beneath can result in aseptic necrosis, subungal haematoma or discomfort.

Treatment

The simplest treatment is to file the nail with an emery board to reduce thickness. Patients can try to cut the nail by using nail cutters to nip at the nail from one side to the other. Trying to cut the whole nail at once is not possible and is where most people fail when attempting to trim it themselves. A podiatrist may be able to reduce with a drill, or in some cases offer a total nail avulsion.

3 SWEATY FEET/ HYPERHIDROSIS/PITTED KERATOLYSIS

Sweaty feet can be embarrassing for the individual and present an increased risk of bacterial and fungal infection. Patients are often affected by the smell (bromidrosis). Mechanical changes in the skin's strength when maceration occurs can produce fissures or pitting from bacterial activity.

Treatment

Reducing sweat will reduce the bio-burden. Dependent on severity, topical medicaments may be of therapeutic benefit. An antiperspirant that contains aluminium chloride is recommended and, if the condition is mild/moderate, then Driclor® (Stiefel) or Anhydrol Forte® (Dermal Laboratories) roll-ons can be prescribed or bought over-the-counter (NICE, 2014c)

If the condition is particularly severe, potassium permanganate soaks should be considered. The patient will need to put 3–4 good size crystals into a bowel of warm water so that it just covers the feet. This should be done daily for 1 week, reducing to alternate days for a week and then 1–2 times weekly. Patients should be advised that if browning of the skin or nails occurs to reduce the number of crystals used. Patients should also be advised to wear leather shoes and woollen/cotton socks, sweat absorbing and odour eliminating insoles may also be of benefit (Frowen et al, 2010).

If the condition cannot be managed conservatively, the patient should be referred to dermatology for consideration of botox, ionotophoresis or even sympathectomy.

4 ATHLETE'S FOOT AND FUNGAL NAILS

Tinea pedis presents as pruritic, erythematous and inflamed regions of the foot (*Figure 3*). It is commonly found between the toes (interdigital), on the sole (vesicular type) or on the medial and lateral aspects of foot (moccasin type; Chadwick, 2013).

Meanwhile, colour and dystrophy are the most important clues to diagnosis of fungal nail infections (Chadwick, 2013). It is important to note that treatment should not be initiated on clinical grounds alone. Although 50% of all cases of nail dystrophy are fungal in origin, it is not always possible to identify such cases accurately (Roberts et al, 2003). Nail and/or skin scrapings should be taken prior to commencement of oral drugs and obtaining scrapings from beneath the nail will increase reliability of the result (*Figure 4*).

In terms of how specific nail infections present, the following should be considered:

- Lateral onychomycosis presents as white or yellow opaque streaks along one side of the nail.
- Distal onycholysis and hyperkeratosis presents as scaling under the distal nail; the nail is discoloured, opaque, thickened and as a result, the end lifts up.
- Superficial white onychomycosis

presents as small, flaky, white patches and pits that appear on the top of the nail plate. The nail becomes roughened and crumbles easily

- Total dystrophic onychomycosis presents as a thick, crumbly and completely destroyed nail (Chadwick, 2013).

Treatment

Mild, non-extensive skin infections should be treated with clotrimazole, econazole or miconazole (NICE, 2014b). For dermatophyte skin infections, topical 1% terbinafine once or twice daily for a week may be considered (Crawford, 2006; Crawford and Hollis, 2007; British Infection Association, 2009).

Terbinafine is fungicidal (kills the fungus) as opposed to fungistatic (prevents fungal development). If the infection is intractable, oral terbinafine should be considered. For dermatophyte of the nail, oral terbinafine — 250 mg once daily for 3–6 months — should be considered (Crawford, 2006; Crawford and Hollis, 2007; British Infection Association, 2009).

For nail infections with non-dermatophyte moulds (*Aspergillus* species) or *Candida* species, oral itraconazole should be considered (given as pulsed therapy – three courses of 7 days per month). It should be noted that liver impairment may occur with terbinafine and itraconazole.

5 CHILBLAINS (PERNIOSIS/PERNIO)

Young and older people are the two age groups predominantly affected by chilblains and these are classified as either acute or chronic. When feet are cold, the arterioles undergo vasoconstriction, which warms the affected area too quickly and results in a chilblain. The sudden rush of hot blood into the cold toe causes tissue damage. Diagnosis is based on clinical presentation. The lesions usually appear as single or multiple red patches, papules or plaques on a cool oedematous base (NICE, 2014a).

Treatment

Prevention is better than cure and, therefore, individuals should avoid rapid warming with hot water bottles or other heat sources. Warm, well insulated shoes should be recommended. Also, two pairs of thin socks are better than one thick pair as air aids insulation. Feet should be warmed gradually using a blanket or massage. There is currently no evidence to support the use of over-the-counter topical preparations for chilblains and they are not recommended (NICE, 2014a). The clinician should check if beta-blockers have been commenced as there may be an association with their vasoconstrictive side effects. If the patient is on a beta-blocker this should not be stopped, but the individual should be referred back to the GP for a medication review. In severe, chronic or recurrent cases, referral to the individual's GP should also be initiated for consideration of low dose nifedipine (NICE, 2014a). Patients should be discouraged from scratching and open lesions should be dressed with a dry dressing. If an antimicrobial is indicated, there is anecdotal evidence that inadine may be beneficial.

6 VERRUCAS

Viral warts are a common skin disease, most frequently affecting the hands and feet. They are caused by the human papilloma virus. While warts are not harmful and usually go away without any treatment, they can be unsightly and painful (Gibbs and Harvey, 2006). Typically, they are distinguishable by the presence of black dots at their centre; these are thrombolised arterioles (*Figure 5*).

Treatment

Verrucas should be filed with an emery board and tea tree oil applied twice daily. Patients can be reassured that the condition is self-limiting. They should also be encouraged to wear flip flops, a plaster or verruca sock over the affected area in communal areas as this should help prevent the verrucas spreading. Patients do not need to abstain from sporting activities. For severe or painful verrucas, 50% salicylic acid should be applied daily as this has been shown to be as effective as cryotherapy, while being more cost effective and less painful (Cockayne et al, 2011). Caustic agents are not recommended for individuals who are deemed 'at risk,' such as people with diabetes or poor circulation.

Figure 4. Fungal nails.

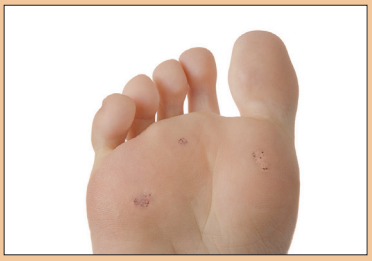

Figure 5. Verrucas.

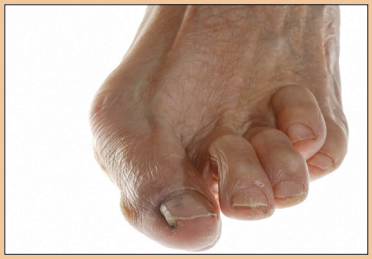

Figure 6. Bunion.

7 FLAT FEET/HIGH ARCHED

Pes planus (flat feet) and pes cavus (high arched feet) are very common. The pes planus foot is a pronated foot type (turned in) and a pes cavus foot is a supinated foot type (turned out). If the patient is not experiencing foot pain then little needs to be done as this is usually within the biological accepted normal variance.

Treatment

If pain is present, however, referral to a podiatrist specialising in musculo-

skeletal problems (biomechanics) for assessment for innersoles or exercise may be beneficial.

8 BUNIONS/TOE DEFORMITIES

Toe deformities can result from underlying systemic disease, such as diabetes or rheumatoid arthritis, and in these cases good control of the condition is pivotal. It may also occur as a result of osteoarthritis (general wear and tear) A bunion (hallux abductovalgus) can be mild to severe, with the most severe form presenting as hallux deviation across the foot, resulting in subluxation and retraction of the second toe. Clawed, hammer, mallet and retracted toes may cause the individual severe discomfort, causing corns, callus or ulceration, and prevent them from being able to wear their usual choice of footwear (*Figure 6*).

Treatment

Treatment for bunions focuses on good footwear advice (see *Tip 10*). If toe deformity occurs, its progression may be slowed with orthotic intervention. Patients should be referred to a musculoskeletal (MSK) podiatrist. If the condition is causing severe discomfort then early referral to orthopaedics can improve patient wellbeing.

9 PLANTAR FASCIITIS/HEEL SPURS

The plantar fascia inserts into the calcaneus and may become strained at its insertion if the foot excessively pronates. The fascia warms on walking and is able to stretch more easily when in motion. Once the individual stops walking, the fascia cools, shrinks and pulls on the insertion. The condition is, therefore, typified by pain elicited post-walking or worse, when weight bearing recommences. A heel spur may be associated, but this is self-limiting and usually resolves spontaneously.

Treatment

The majority of cases will resolve with calf and plantar fascia stretches. Stretching of the gastrocnemius, soleus and fascia is important. A rolling pin, hard ball or a frozen, water-filled plastic bottle may alleviate discomfort when rolled beneath the arch. The patient should be referred to MSK podiatry for orthotics. Anti-inflammatory medication and steroid injections can be useful in recalcitrant cases.

10 FOOTWEAR

Understanding how to fit a shoe is an important yet simple skill. In terms of treatment, patients should ensure the widest part of their feet (i.e. the first metatarsal head to the fifth metatarsal head) is measured. The shoe should be placed on the bottom of the foot with the sole upward; if the foot overhangs the shoe, the shoe is too small for the foot.

The foot should not touch the end of the shoe and there should be approximately 1–1.5 cm space from the longest toe to the end of the shoe when standing. If the toes are retracted, the shoe length should accommodate as if the toes were not retracted as not to affect the heel/forefoot ratio. A toe box should be deep enough to accommodate the highest toe with at least a 1 mm gap. The heel cup/counter should be relatively stiff and supportive.

Slip-on shoes are not recommended for patients with toe deformities or pain and shoes that fasten with a lace, Velcro® strap or buckle are best as these hold the shoe in place and provide support. If an individual cannot wear off-the-shelf shoes then the cause should be addressed (e.g. if this is due to odema or deformity). If the root of the problem cannot be addressed, referral to an orthotist or podiatrist who specialises in footwear may be necessary.

Conclusion

Foot complaints are common, but good foot care advice can help patients stay ambulatory, pain-free and reassured. Regular nail care, good hygeine and appropriate footwear can prevent the majority of conditions occurring in the first instance. WE

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Mental Capacity Act and its relevance to wound care

Patient consent is an absolute requirement before a health care professional can carry out any care or intervention for a patient. Most of the time this will not be problematic, but there will be occasions when clinicians encounter patients who refuse recommended care and treatment. There will also be the need to provide care in situations where patients are unable to give consent. The Mental Capacity Act (2005) (Department for Constitutional Affairs, 2005) provides a legal framework for protecting patients who lack capacity to give consent and the professionals who care for them. This article will outline the key principles of the Act and the capacity assessment. A case study will illustrate the mental capacity assessment in practice.

In 1994, a patient (referred to here as Mr C) was diagnosed with a serious and life-threatening gangrene in his foot. His surgeon recommended amputation, however, Mr C refused to give consent. Mr C had a diagnosis of schizophrenia and was a long-term patient in a high security psychiatric hospital in UK. This decision caused a conflict between Mr C's psychiatrist and his surgeon. His psychiatrist believed he was unable to make a valid choice because of his delusional beliefs, which included believing he was a 'great doctor.' She felt to respect his wishes would lead to his unnecessary death. His surgeon believed he had the right not to consent to the surgery, and that the central issue was whether Mr C had the mental capacity to make a choice, not whether the doctors agreed with his decision.

The case went to the High Court and the judge determined that Mr C did indeed have capacity to make an informed decision, having demonstrated an understanding of his situation, the ability to remember and believe the medical information received and an ability to weigh up the options.

This proved to be a landmark case in establishing patients' capacity to decide what happens to their bodies. The concept of capacity was eventually given statutory force in the Mental Capacity Act (MCA) (2005) (Department for Constitutional Affairs [DCA], 2005).

This article will outline the key principles of the MCA and discuss how it can be relevant when providing wound care. A case study will be used to illustrate one example.

The Key Principles of the Mental Capacity Act (2005)

The MCA came into force in 2007, and relates to all persons over the age of 16 in England and Wales.

"The Mental Capacity Act (2005) provides a legal framework for protecting patients who lack capacity to give consent and the professionals who care for them."

ELIZABETH NICHOLS
Tissue Viability Nurse Specialist
Your Healthcare CIC, Kingston, Surrey

The MCA is primarily about setting criteria for establishing an individual's capacity to make decisions. It also makes provision for people to appoint someone to act on their behalf in the event of them not having capacity in the future, through a Lasting Power of Attorney or Independent Mental Capacity Advocate (IMCA). Without this legal agreement, no family or friend has the power to make decisions on behalf of someone else, and treatment is then decided by the person providing that treatment, following the principles of 'best interests' (McHale, 2009).

Box 1. The five main principles of the Mental Capacity Act 2005.

Always assume the patient has mental capacity unless it is proven otherwise by undertaking a Mental Capacity Assessment
Before deciding a patient lacks capacity, ensure all practical steps have been taken to support the patient with the assessment
An unwise decision does not mean that the patient lacks capacity to make a decision
Any decision made on behalf of a patient lacking mental capacity must be made in their best interests
Always consider whether there is a least restrictive option when making any best interests decision.

The five key principles of the MCA are outlined in *Box 1*. There are two stages to the assessment to determine mental capacity. The first is to ask: "Does the person have an impairment of, or disturbance in, the functioning of the mind or brain (this may be temporary or permanent)?" This could include diagnoses of dementia, brain injury, learning disability, or temporary states such as delirium or intoxication.

If the answer to this question is 'no' then the person is deemed to have capacity to make decisions. If the impairment is likely to be temporary then if possible the decision needing to be made should be left until capacity returns. Every assistance should be given to help the person make the decision (e.g. communication aids, written or visual information, time of day if this affects mental state). If the answer is 'yes', however, then a second question needs to be asked: "Is the impairment or disturbance sufficient that the person lacks the capacity to make a particular decision?"

The fact that a person has an impairment or disturbance of the mind or brain does not automatically mean they lack capacity. Four key questions need to be asked to establish capacity.

- Can the person understand and absorb basic information relevant to the decision to be made?
- Can the person retain the information long enough to process it?
- Can the person weigh up the advantages and disadvantages?
- Can the person communicate his or her decision?

It is important to understand that the mental capacity assessment is undertaken for a specific decision and is not a 'blanket-cover' assessment for all decisions. People may fluctuate in their decision making ability, or be able to make decisions about some aspects of care or daily life, but not others. The assessment must, therefore, be carried out at the time the decision needs to be made and is the responsibility of the person providing the care at the time (Bingham, 2012)

Consent

Consent is required before any clinician can touch a patient (Department of Health, 2009) and intervention without valid consent may constitute a civil or criminal offence of battery (Ford, 2010). Consent can be given in a number of ways (verbal, written or implied) and can be withdrawn at any time (Ford, 2010; Guy, 2010). All clinicians should follow their organisation's consent policies and procedures, as well as any professional guidance. For consent to be valid, it is necessary that the person has the mental capacity to give consent. It is in cases where there is doubt over a patient's capacity that a mental capacity assessment should be initiated.

Provided a person has capacity, he or she has the right to provide or withhold consent from treatment or care. Decisions to refuse treatment or care are often difficult for clinicians to understand or accept (Beldon, 2014), and can create conflicts of interest in the nurse-patient relationship. Patients have the right to make decisions which may be seen as unwise by a clinician. It is essential, however, that the patient has been provided with all relevant information to help them reach their decision, including benefits and risks, and potential consequences of each option, in a way that is accessible

for them to understand. This must be documented in the patient's records, with details of any conversations and discussions provided (The Nursing and Midwifery Council, 2008).

MCA and wound care

Any intervention to provide wound care will require consent from the patient (e.g. changing dressings, applying compression bandaging or hosiery, skin inspection as part of pressure ulcer prevention, or provision of pressure relieving equipment). Nurses may often encounter conflicting views or behaviour by patients when attempting to deliver 'best practice' care. For example, patients sometimes decline bandaging, or pressure relieving equipment, or remove their dressings. Such patients can sometimes be labelled 'non-compliant', which carries negative or judgemental connotations.

'Compliance' is a term that reflects the extent to which patients are seen to follow medical advice and, therefore, non-compliance suggests the problem lies with the patient (Anderson, 2013; McNichol, 2014). Concordance is a term advocated by the Royal Pharmaceutical Society to reflect an emphasis more on partnership and negotiation, which takes into account the patient's perspective, and where there may need to be an agreement to differ at times (Anderson, 2013).

This is often a source of frustration to both patients and nurses. Nurses are anxious to provide 'best practice' care in line with evidence and guidelines to achieve the best outcomes for patients in terms of wound healing or pressure ulcer avoidance. Additionally, organisations are monitored and audited on outcomes (such as venous leg ulcer healing rates, or pressure ulcer incidence rates), which may be linked with financial penalties if targets are not achieved. Therefore, patients who refuse recommended care and treatment can cause nurses anxiety if harm occurs as a result of the patient's decision not to accept care, or outcomes are not met.

Patients must be provided with sufficient information, including all options, benefits and risks, and implications of their choices, in a way they can understand. Reasons for refusal of care or treatment should be explored with the patient. For example, patients may be unable to tolerate compression bandaging due to uncontrolled pain, or they may decline pressure relieving equipment because of fears of not being able to sleep in a double bed any longer with a partner or spouse.

"If there is any doubt or uncertainty over a patient's capacity then the two-stage mental capacity assessment must be conducted and documented using the structure outlined in the Mental Capacity Act."

It may be that during such open discussions, misconceptions can be corrected, or compromises reached. However, if patients have mental capacity then their autonomy must be respected (Bedford and Jones, 2014). Clause 14 of the NMC Code of Conduct (2008) states that: "You must respect and support people's rights to accept or decline treatment and care". The MCA (2005), therefore, gives protection to clinicians when patients with capacity make decisions that may be detrimental to their health. It is important to ensure a full record of discussions is documented, and that the decision is reviewed from time to time as patients can change their mind over time as their situation changes or as new information comes to light.

If there is any doubt or uncertainty over a patient's capacity then the two-stage mental capacity assessment must be conducted and documented using the structure outlined in the MCA (Mughal, 2014). Organisations may have their own locally agreed formats for recording this, which should be followed. It is important to be clear which decision the assessment is relating to as patients may have capacity to make some decisions but not others. Capacity may fluctuate and where possible assessment should be delayed until the person regains capacity. If treatment cannot be delayed, then the clinician providing the care needs to make a decision in the person's best interests at that time (Stevens, 2013).

A best interests decision should be made after considering the patient's clinical need, and the benefits and burdens of treatment on their health and life expectancy. It should also involve any parties who know the patient well (e.g. family/close friends/GP) and who would be able to advise on what the patient would most likely want if they could express their wishes, based on their values and belief systems (Griffith, 2006). However, unless there is a legal Lasting Power of Attorney in existence, families do not have any legal right to make decisions on behalf of the person (DCA, 2005; McHale, 2009). The decision must not be based solely on age, appearance, behaviour or condition (Mughal, 2014).

The case study below illustrates how the mental capacity assessment was conducted and documented

in the case of a patient who was refusing pressure relieving equipment.

Case study

Mrs B is a 77-year-old woman with Type 2 diabetes mellitus and a medical history that includes a previous brain tumour, coronary artery bypass graft and a cerebrovascular accident (CVA) with resulting right-sided weakness and expressive dysphasia. She lives alone with twice-daily visits from carers and regular visits from District Nurses (DNs) for pressure area checks and blood tests. She is keen to be independent and struggles to accept that she needs help at times, resulting in a number of falls over a short period, but on each occasion she has refused to go to hospital for X-rays.

The DN was requested to visit when the carer noticed she had a 'sore heel'. On inspection by the DN, she was observed to have a black eschar (unstageable pressure ulcer) on her right heel measuring 3.8 x 2cm and it was tender to touch. Her Waterlow risk assessment score was 20 (very high risk).

Mrs B had recently started sleeping in a chair at night and refused to go to bed. The DN was concerned the heel ulcer had developed as a result of her resting her heel on the floor for support at night while sleeping in a chair and recommended she sleep in her bed on her pressure relieving mattress and have a pressure reducing cushion on her chair. Mrs B refused both the above. The carers were asked to monitor her heels daily, and inform the DN of any change. The DNs also visited twice weekly to monitor the situation. There was concern that Mrs B was at high risk of further pressure area damage and deterioration of the existing heel ulcer without the recommended equipment or interventions, and as there was concern over her mental capacity to make these choices, a mental capacity assessment was conducted following the structure laid down in the MCA (2005).

The decision

Mrs B has declined the recommendations to go to bed at night and to accept a pressure reducing cushion on her chair.

The Reason for the MCA

As previously mentioned, Mrs B had a CVA several years ago leaving her with a right sided weakness and severe dysphasia. Her verbal communication is significantly impaired. There is reason to be concerned that her decision to refuse recommendations may be associated with a cognitive impact from her CVA. She tends to be unrealistic about her physical limitations, and she will try to do things that put her at risk of falls.

Support to help patient make decision

Written information was provided on the causes and prevention of pressure ulcers to supplement verbal information given by the DN. A photograph was taken of her heel with her consent and shown to her to help her understand the results of pressure on her heel.

Is there an impairment of, or disturbance in, the functioning of the mind or brain?

Yes. Mrs B has had a CVA with subsequent physical and communication difficulties. There is a possibility of some cognitive impairment also.

Is the patient able to understand the information relating to the decision?

Yes. Understanding was evidenced from examples of interactions between the DN and the patient. While she declined equipment, she did agree to recommendations about sitting posture, elevating her legs and 'floating' the heels. Additionally, there were concerns that she was not taking the correct dosage of anticoagulant medication. Mrs B demonstrated to the DN the dosage she was taking, which was evidence that she could understand and respond to complex verbal requests. Questions were asked in different ways to yield both a 'yes' and a 'no' answer to the same question, and Mrs B was consistent in her responses.

Is the patient able to retain the information long enough to process it?

Yes. Mrs B gave consistent responses to the same question when asked in different ways on different occasions. She also remembered advice on sitting posture and was implementing this.

Is the patient able to weigh up and use the information?

Yes. Although communication was difficult, Mrs B understood that the photograph was of her heel and appeared shocked when she saw it. When it was explained that if the heel got worse she might need to go to hospital she clearly indicated she was not in agreement with this through gestures, limited speech, and her answers to the same question worded differently.

Is the patient able to communicate her decision?

Yes. Although verbal communication was severely limited, Mrs B repeated the same terms, but with different emphasis, which is understood by those who know her well. She could nod and shake her head, and use physical gestures to indicate her desires.

Following the mental capacity assessment, it was felt on balance that Mrs B did have capacity to decline the recommendations being made by the DN. As a result, liaison with the GP, care manager and care agency took place to discuss the risk that remained, and this was then reflected in her care plan for all agencies to follow. She

continued to be monitored closely by her carers and the DNs, and the heel ulcer went on to heal subsequently.

Conclusion

The Mental Capacity Act (2005) provides the legal authority and protection to deliver health and social care where a person lacks capacity and cannot give consent. It also protects the right of people who have capacity to make decisions which may conflict with the recommendations of health and social care professionals.

Any decision by a patient to refuse care or interventions that could prove to be detrimental to their health must be fully explored with the patient and resolution sought. If the patient has full mental capacity then their decision must be respected and all conversations documented in the patient's record.

If there is concern that the patient may not have the capacity to make an informed choice, then a mental capacity assessment should be conducted and documented. This should be performed by the health care professional needing to provide the care at the time, and the particular decision needing to be made must be clearly defined.

If after assessment the patient is considered not to have capacity, a decision about the delivery of care or treatment needs to be made in their best interests, using the principles set out in the MCA (2005). If in any doubt about a patient's ability to give valid consent to treatment, then advice should be sought from a more senior colleague. Many NHS organisations will also have an Adult Safeguarding Lead who will be able to give advice and support WE

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Ten top tips for taking high-quality digital images of wounds

Wound photography can enhance the assessment of the patient, their wound and environment if the images are clear. Used in association with a medical and wound history, images will influence decision making and the planning of treatment, and they also provide an opportunity to map the wound. This article underlines ten top tips associated with taking high-quality digital images of wounds. These simple guidelines are given to support of the unskilled photographer to achieve clear, crisp wound images.

The adage "Use a picture. It's worth a thousand words" was first used in a newspaper article in 1911 (The Phrase Finder, 2014). This statement is also applicable in wound care, as an image allows for the thorough assessment and mapping of a wound.

Clinical images potentially enhance the assessment of patients, their wound and their environment — in terms of the latter, a wheelchair, a bed, even clothing can influence wound healing (Buckley et al, 2009). When providing care at a distance, for instance, via telehealth or telemedicine in Australia, wound images are frequently taken to assist in diagnosis and treatment of the patient.

These photos are often taken by unskilled photographers, including nurses, relatives, or even patients themselves. The quality of images will vary, but the aim is always to use the images in association with the patient's wound and medical history; using written descriptions to evaluate the wound, plan treatment options and monitor progress (Sikka et al, 2012; Sperring, 2013).

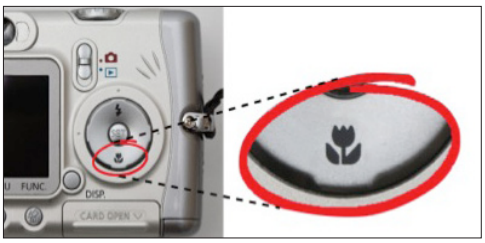

Figure 1. ***Macro function — identified by the flower icon highlighted here — switches the camera into a close focus mode, allowing more detailed images of the wound to be taken.***

Attention should always be on the patient, ensuring that they are well informed, comfortable and aware of the processes (Creighton et al, 2012). Managing wound images and patient information involves issues of consent, confidentiality, privacy and security (Burns and Belton, 2012; Routsalainen, 2010) and all images in this article were used with the written permission of the patient.

BETH SPERRING
Acting Clinical Nurse Consultant, Plastic Surgery Telehealth Service

RALPH BAKER
Coordinator of Medical Illustration

Both are based at the Royal Perth Hospital, Perth, Western Australia, Australia.

Addressing these issues involves all health services and professionals. Secured messaging systems must be used when sharing images and the healthcare professional should be aware of, and ensure compliance with, policies, regulations, and acts that govern practice (Garg and Brewer, 2011; Fernando, 2013).

This article provides ten top tips for the unskilled photographer (Rennert et al, 2009; Prentice and Baker, 2013) with the aim of helping to produce clear, crisp images of wounds that will be clinically informative.

1 USE A DIGITAL CAMERA OWNED BY YOUR PLACE OF WORK

- This should be simple to use, i.e. 'point and shoot'
- It should have an SD memory card – at least 4GB, two cards will ensure sufficient memory
- It should also have a macro function (identified by the flower icon; *Figure 1*) — this switches the camera into a close focus mode. This feature is present on most compact digital camera.

2 SET THE TIME AND DATE ON THE CAMERA

It is important that the camera records the date of an image, which will be the date shown in any database system used to store images.

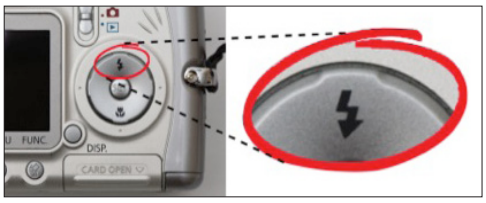

Figure 2. ***The flash Function should be set to 'on.'***

3 GET THE LIGHT RIGHT

The clinician should ensure the camera flash is set to 'on' — not 'auto' or 'off' (*Figure 2*).

4 TAKE THE FIRST PHOTOGRAPH OF PATIENT DATA

The first photograph should give the patient's demographics, including patient name/identification number, date of birth, location, and a brief clinical history. Store this photograph with the patient's other images to help identify images for quality improvement audits.

5 MAKE THE WOUND THE ONLY FOCUS

Remove clutter from the background and use a white drape behind subject or limb (*Figure 3*). This will aid with clarity and prevent the background being a distraction.

6 STANDARDISE THE VIEWS TAKEN OF THE WOUND

Previous photographs that have been taken of the wound should be checked to ensure you take similar views, magnification and angles. This will assist when reviewing images over a period of time.

7 GET THE ANGLE RIGHT TO TAKE A PROPORTIONAL IMAGE

When taking a photograph, the camera body should be parallel to the subject (*Figure 4a*).
This results in a photograph that presents accurate proportions of the subject (*Figure 4c*).
If the camera body is not parallel to the subject (*Figure 4b*), the proportions of the subject will be distorted (*Figure 4d*), making effective assessment of the size and extent of the wound in the image difficult.

8 ESTABLISH THE WOUND LOCATION FOR THE VIEWER

The first photograph should show the location of the wound in relation to the body to provide a sense of perspective.

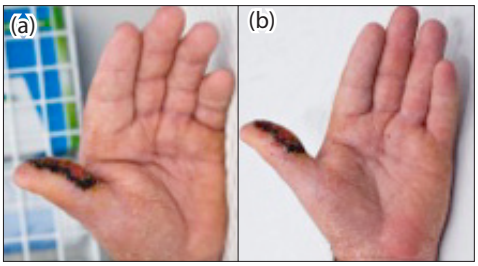

Figure 3. ***(a) Do not photograph the wounds with clutter in the background. (b) A white drape should be placed behind the wound to allow clear visualisation.***

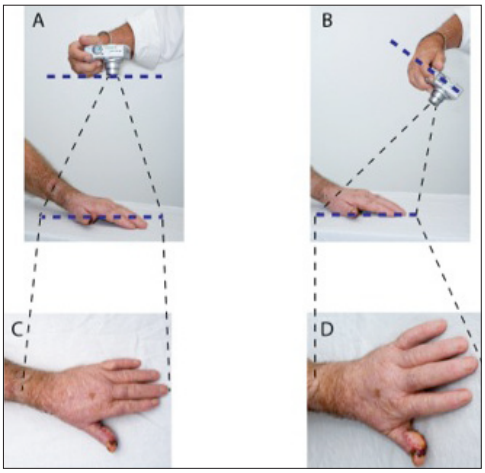

Figure 4. ***(a) Correct position for the camera body to be held in order to take (c) a proportional view of the subject; (b) holding the camera body at an angle to the subject results in (d) a distorted image.***

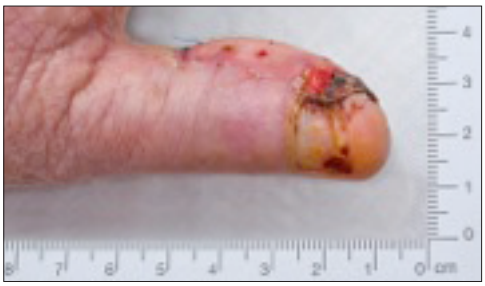

Figure 5. ***A close-up image including scale.***

9 CLOSE-UP IMAGES ESTABLISH DETAIL FOR THE VIEWER

A close-up photograph should be taken using the macro setting (as described in top tip 1; *Figure 1*). A ruler should be placed near the wound to give an accurate indication of the wound size (*Figure 5*).

An L-shaped ruler is preferable, however, a standard ruler also works well. The photograph should be checked to determine whether it is in focus on the screen before leaving the patient. Blurred photographs should be discarded as they can be misleading.

10 SECURELY SAVE AND STORE THE IMAGES

Images should be uploaded to a secure location or database at the end of the consultation and delete the images from the camera. The most secure method of removing images is to reformat the DS memory card via the camera menu.

Conclusion

Wound images provide a visual reference, not matched by memory or the written word (Swann, 2010). Wound photography is utilised for the assessment and mapping the wounds over time. With the increase in available technology, clinical photography is no longer the role of the specialist photographer and these guidelines provide assistance to the unskilled photographer to achieve clear, crisp wound images that show the location and characteristics of the wound. This information, when used in association with the medical and injury history, supports decision making for wound management. WE

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The role of the tissue viability nurse

This article describes the role of the tissue viability nurse (TVN), which can differ from one Trust to another. However, at the core of the role is the provision of expert advice in the prevention and the treatment of wounds of differing aetiologies. TVNs require many skills, but communication skills are essential to liaise between the generalist nurse, the many multidisciplinary teams and the patient, as well as promote excellency in wound care.

Tissue viability is a relatively new discipline, which started in the 1980s and has been defined as a growing speciality that primarily considers all aspects of skin and soft tissue wounds, including acute surgical wounds, pressure ulcers and all forms of leg ulceration (Tissue Viability Society, 2014). However, tissue viability nurses (TVNs) have a multifaceted role, which has developed differently in each region to reflect local requirements.

Wound care is not the only aspect of the job; TVNs also deliver education, develop practice, and undertake audit and research. Some TVNs may manage a budget and some work within a well-defined speciality, however, most work across all specialities autonomously, without direct medical or nursing supervision, in collaboration with medical, nursing and all professions allied to medicine. Tissue viability is often part of the senior nursing team of an organisation and with that comes certain tasks that have to be undertaken within the corporate umbrella; tasks that sometimes do not have much to do with Tissue viability, but that are important to the organisation nonetheless.

Tissue viability work very closely with a number of NHS teams (such as procurement, pharmacists, finance department, as well as all the clinical multidisciplinary teams) and non-NHS staff (for example, industry — who develop the dressings — but also care homes, hospices and private sector hospitals). In order to thrive, tissue viability teams have to be masters at communication as all of those aforementioned 'agencies' command very different relationships.

Tissue viability and pressure ulcers

Currently, most tissue viability teams (TVTs) across the UK are working hard to reduce the incidence of pressure ulcers across all settings. TVTs have the responsibility to ensure that all damage is accurately categorised and reported as most Trusts have been set Commissioning for Quality and Innovation (CQUIN) targets, which typically involve an ongoing reduction of Trust-acquired pressure damage.

Failure to achieve these targets involves a significant financial penalty that Trusts can ill afford. TVTs are assisting their colleagues to implement protocols, such as the SSKIN (Surface, Skin inspection, Keep Moving, Incontinence and Nutrition) bundle of care; turning regimes (intentional rounding); providing continuous education on pressure ulcer categorisation; and finally,

"Wound care is not the only aspect of the job; tissue viability nurses also deliver education, develop practice, and undertake audit and research, as well as manage budgets."

FANIA PAGNAMENTA
Nurse Consultant (Tissue Viability), Newcastle upon Tyne Hospitals NHS Foundation Trust, Newcastle

providing expert advice to manage pressure ulcers.

Dressing selection for wound formularies

Most Trusts develop wound formularies to assist clinicians with selecting from a shortened list of products. This is to support them in wound care. With a limited dressing selection, it becomes easier to use them efficiently; as training can be targeted, it becomes less confusing to select the appropriate product for a specific wound. TVTs are usually open to new suggestions, especially if what is available to the generalist does not meet their needs or those of the patients they care for. TVTs rely on feedback from generalists and are receptive to change protocols if required.

One of the most difficult parts of the TVN role is to make decisions on what product to list on a wound formulary as the evidence available is not based on clinical trials and this may come as a surprise to many generalists. There is a huge range of wound dressings available on the market. Evidence-based practice should underpin this choice but, in reality, most of it is based on intuition, unsystematic clinical experience and a rationale based on specific diseases/conditions.

Reddy et al (2008) reviewed all available randomised controlled trials (RCTs) published on pressure ulcer treatment. They reviewed 63 RCTs that evaluated dressings. Of these studies, only seven were classed as being high-quality studies and five of these showed there were no differences between different types of dressings.

However, clinically, some dressings work better than others. Horkan et al (2009) analysed all the systematic reviews undertaken on wound dressings for period of 10 years (1998–2008). They analysed 13 systematic reviews and meta-analysis papers that identified recurrent themes relating to wound-dressing studies. They concluded that the methodological quality of dressing trials was poor, namely the number of participants recruited was consistently low, the sample size being erroneously estimated prior to the commencement of the study.

RCTs are notoriously difficult to conduct in wound care due to the number of variables involved and difficulty in recruiting a control group for comparison. Therefore, case studies are used to base some TV decisions on, often simply by trying a new dressing on a number of patients and observing positive results.

The reason there is little evidence to support dressing selection is that dressings are not like pharmaceutical drugs. In fact, dressings are considered 'medical devices', therefore, the dressings are CE marked, which means that they are safe to be used in the context for which they have been designed for, but the manufacturers are not required by law to provide any evidence of efficacy and, consequently, there is little incentive to fund large trials (Madden, 2012). Undertaking randomised RCTs is time consuming, expensive and difficult to perform in dressing evaluation.

The selection of dressings that are available is proliferating as companies want a share of a lucrative market, which had an estimated turnover of £1bn in 2009 (Department of Business, Innovation and Skills, 2010). Companies market their new products and employ representatives to walk the territory to promote them (Faulkner, 2009). The role of the TVT is to look at what little evidence there is and decide if a new dressing could be useful for certain wounds.

Evaluating a dressing is more than just a case of thinking: "Put it on a wound and see how it performs". It is instead about establishing a number of key factors, namely:

- Ease of use
- Staff education
- Patient comfort (application, and removal and during wear)
- Costs
- Access
- Range of sizes
- Wear time.

Firstly, how easy is the dressing to use, for example which side should be applied face down onto the wound? Introducing a new dressing into an organisation involves educating colleagues on its appropriate use. TVTs are small and many TVNs work alone in their organisation. Therefore, training generalists is time consuming, requiring an effective training plan to be put in place, prior to the introduction of a new dressing.

Patient comfort is also important so feedback from patients has to be collated. Different sizes should be available, for example, paediatric patients will often require much smaller dressings. Dressings need to be ordered and delivered, therefore, whether a dressing is sourced from NHS Logistics or is available on FP10 and can be prescribed, is also a consideration.

Costs are also a key factor to be considered. In the absence of cost-effective studies, TVTs have to decide whether a dressing is affordable and, in reality, the unit cost of a dressing is a relatively small factor. Issues such as wear-time, need for additional dressings and nursing time all constitute the most expensive elements of wound care.

Tissue viability team philosophy

Simplistically, there are two types of TVT and both follow different philosophies of care. There are teams whose ethos is to empower generalist nurses with the skills that are required to look after patients' wounds. These teams tend to be small; often there is only one TV specialist working by her/his self. The larger TVTs tend to undertake most of the wound care for patients in their organisation, where the belief is that wounds treated by a specialist will heal much quicker. In the absence of evidence of one philosophy working better than another, it is up to individual

establishments to decide which way their TVT will work.

Kohr (2007) explained how wound care has traditionally been classed as basic patient care, along with other activities such as toileting and feeding and, therefore, in the remit of generalist nurse's role. This view that it is 'basic' needs to be challenged as wound care is a skilled area of nursing requiring knowledge and competency. However, there is a fundamental level of knowledge about wound healing that generalists should possess.

Tissue viability and generalists

TVTs rely heavily on generalists who are the eyes and ears of what happens in their workplace to identify and refer patients who are not healing as expected. They need to know how and when to make appropriate referrals.

Generalists are continuously asked to work more with fewer resources. Vacant posts are left unfilled as the UK is embarking in a recruitment crisis and however good-willed generalists are, there comes a time where they really struggle to find the time to dress wounds as part of 'basic nursing care.' Wound care is increasingly delegated to Healthcare Assistants, especially in primary care and the role of the TVN is in educating and training unregistered colleagues, but also in supporting generalists in recognising their accountability in delegation.

From novice to expert in wound care

Benner (1984) described how nurses move from being novices to expert in making decision about their patients' care. As a nurse gains experience, they move through a continuum that sees them shift from working within strict protocols and rule-based thinking to intuition. In wound care, where each individual nurse is on the continuum is very visible indeed. While most nurses have workable wound care knowledge, some adhere strictly to written protocols even when the protocol no longer is suitable. For example, when a postoperative wound becomes infected and the same type of dressing continues to be applied, without actively taking care of the infection. Moving from 'advanced beginner' through to 'competent,' in the middle of Benner's continuum, a nurse would continue to adhere to the protocol, but would seek support from the TV specialist. Conversely, those that are 'proficient' would treat the infection and change the dressing regimen without requiring support from the TVNs.

At the novice end of wound care, nurses are guided by rules and by task completion, where a dressing is simply a task that needs doing. These nurses need dressing protocols to function and the role of the TVN is to provide these protocols, ensuring that they work effectively in their setting. TVNs also need to educate the novice nurse to recognise signs of infection, inflammation or any other deviant problem that causes a wound not to heal.

Nurses who have gained experience in wound care will inevitably be working with intuition, with the ability to recognise situations where a certain course of action worked well for a certain wound. With experience, they will recognise if a dressing will work in a given situation or not. These nurses will require a different input from the TVN. Their experience will also be of great assistance when developing wound formularies.

Tissue viability nurses as experts

TVNs have additional knowledge and skills; many have undertaken additional studies to Master's level and higher and have advanced clinical skills, such as sharp debridement or prescribing. They need to keep abreast of new developments in tissue viability and ensure their organisation's policies and procedures reflect current best practice guidance, for example, from organisations such as NICE, European Pressure Ulcer Advisory Panel, Scottish Intercollegiate Guidelines Network, Royal College of Nursing, World Union of Wound Healing Societies to name but a few.

Conclusion

This article aimed to open a small window on the role of the TVN and their teams. The TVN job is a multifaceted role that can differ substantially from one setting and region to another. TVTs serve the need of the population they work with and the key message is that good communication between generalists and Tissue Viability is essential for the health and wellbeing of the patient. WE

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Patient perspective: surviving pilonidal sinus with infection

Phil Martin is a 62-year-old father of four and chief executive officer for a hospitality equipment company in Cambridge. Seeing Phil in his suit and tie, one would never know that less than 4 months ago, he was being discharged from the hospital where he spent 3 months being treated for one of the largest and most complex wounds the tissue viability team at Hinchingbrooke Hospital, Huntingdon, had ever seen. Through interviews, this is the story of the positive attitude and the creative medical and nursing team that saved Phil's life.

"Little did Phil know that night that he would not be returning home for months and that the seemingly harmless lump would see him undergoing surgery 15 times over the next 21 days."

AYSHA MENDES
Freelance journalist, specialising in health, psychology and nursing

In early spring of 2014, Phil Martin discovered a small bump on his buttocks. After a couple of failed attempts to book an appointment with his GP, he rationalised that it was unlikely to be anything serious and went about his usual business. Phil is the chief executive officer of a company that provides equipment to the hospitality industry and it is not unusual for his work to include regular travel.

About a month or two after his initial discovery of the bump, he came home from a working trip in a lot of pain and asked his neighbour to take him to the accident and emergency (A&E) unit. Little did he know that night that he would not be returning home for months and that the seemingly harmless lump would see him undergoing surgery 15 times over the next 21 days.

Where the wound began

Phil came into the hospital with a perianal abscess, which he had been ignoring for at least a month. "The doctor took one look at it and said to me, 'You're not going anywhere anytime soon,'" remembers Phil.

Phil was found to have pilonidal sinus, which can be caused by an ingrown hair that becomes infected. It appears as a small hole in the skin, which usually develops in the cleft of the buttocks and which is twice as common in men as it is in women (NHS Choices, 2012). However, it had been at least one month by the time Phil had the bump next to his anus checked. Not only had it become infected but, as the infection had been left untreated, pus had built up within it, hardened and created a large abscess.

Even more worryingly, septicaemia had set in, which can be potentially fatal. Phil was taken into surgery to begin clearing infected material and relieving the symptoms of infection — in his case, pain — and was also put on antibiotics. However, due to

Sarah Thompson and Phil Martin, who credits Sarah and her colleagues for his recovery.

"'My body just kicked in and took over. But my family wasn't convinced. They kept trying to talk to me and I wouldn't respond.'"

the severity of the infection, he was put into an induced coma.

24 hours to live

"I remember having a look at his wound when he was still in a coma," says Sarah Thompson, who became Phil's Tissue Viability Nurse (TVN) over the next few months. "He had a drain inserted and a lot of discharge was coming out — I looked at the wound and at how ill he was and I didn't believe he was going to make it."

The doctors did not believe Phil would make it out alive either. As bacteria spread through Phil's bloodstream, his organs began to fail and during surgery, his heart stopped twice. This is when Phil's family received a call from the medical team to come in and say their goodbyes. Phil's sons, Ben and Paul, slept by his beside for 5 days running and his daughters came to the hospital to visit him as well.

"It was very upsetting," explains Phil about the fact that his children thought they were about to lose him. "The close family were very upset and they spent a lot of time with me. They were told I was only going to last 24 hours," Phil says.

The next day, the medical team would begin switching off the machines and would see whether Phil's body would begin to function effectively without them, he remembers. "My body just kicked in and took over; but my family wasn't convinced. They kept trying to talk to me and I wouldn't respond. But all of a sudden I said, 'Why don't you shut up and let me go back to sleep?' and then they knew I was going to be alright."

Travelling infection, creative treatment

While Phil was lucky to have woken up from his coma, he was in a lot of pain and the infection in his buttocks had spread through to his abdomen and then travelled under his skin all the way down his right leg to behind his knee.

In addition to the large wound spreading under Phil's skin, the medical team created four incisions in his legs to allow it to drain. He

also needed to have a stoma formed as a result of the wound to his anus. The medical team applied negative pressure wound therapy (NPWT) dressings to Phil's wound, which did not work due to the sheer size and complexity of the wound. The NPWT dressings were removed and Phil underwent various trips to the theatre for irrigation and debridement.

Phil's wound continued to drain, but the team knew they needed to actively treat the wound to prevent further infections so they had to put their heads together to come up with a solution. Sarah says: "I know that sometimes it is a case of being creative and there is no training out there that can tell you what to do."

As Sarah is a standalone TVN at Hinchingbrooke Hospital, she phoned other TVNs in the area for advice. She decided to separate Phil's large wound into three — perianal, abdominal and leg wounds — by sectioning off parts with dressings, alongside NPWT so that they were more manageable to treat. Sarah says this was one of the most challenging parts of treating Phil's wound and she knew it was possible for it to fail but, luckily, it worked.

The normal NPWT that the team was using reduces exudate and helps stimulate healing. However, Phil's leg was badly infected and needed something that would reduce the bioburden while the wound healed. This is when Sarah called in specialists and this resulted in the introduction of a different negative pressure wound therapy system (V.A.C.Ulta™; KCI), which allowed for flexible treatment and healing of Phil's wound. By this time, Phil was no longer going into the theatre to have his wound washed out. Instead, Sarah was seeing Phil two or three times a week and providing everything he needed on the ward.

A little humour goes a long way

"When I first became aware of the challenges, there was initially some fear. I lost 5 stone in weight and nearly all the muscles in my legs, so getting up and walking was difficult," remembers Phil, who was discharged more than 4 months ago at the time of publication. Phil has not had a pain killer for months and has been doing light workouts to get his strength back up. While Phil credits Sarah and the nursing and medical teams for his recovery, Sarah and her colleagues believe Phil was the key to his own healing.

"Phil as a person is unique and he inspired the nurses," says Sarah. "I've never nursed someone who has been that poorly and we were constantly concerned that he could die at any point, but he'd been to hell and back and he was still telling jokes."

Phil, who saw his practice nurse for daily dressings is now completely healed and has been for 2 months. Before then, he would tell people he had been bitten by a shark.

"I did die twice during surgery, I've been told, and I'm very lucky to have survived,' says Phil. "It was life changing, but I'm a great believer in positive thinking and the challenges were more psychological than physical."

Sarah says she doesn't think anyone else could have made it through Phil's ordeal: "To see him go from a shell of a man in hospital to the way he is now, all suited and booted and giving me abuse, you can't put a price on that," laughs Sarah. "It was Phil's attitude and determination — that's what really saved him." WE

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"... Sarah called in specialists and ended up bringing in a negative pressure wound therapy system" (V.A.C.Ulta™, KCI), which allowed for flexible treatment and healing of Phil's wound."

Eczema associated with venous leg ulcers

When associated with venous leg ulcers, eczema is known as gravitational eczema, stasis eczema, varicose eczema or venous eczema, due to its relationship to the underlying cause. These terms describe the skin changes that occur as a result of venous hypertension where venous pressure is increased in the legs because of incompetent deep and superficial veins. The exact pathophysiology is unclear although it is understood to be associated with leakage of blood products into the surrounding tissues and the activation of the inflammatory cells that cause the skin changes (Draper, 2011). This article will describe how venous eczema develops and what signs and symptoms to look out for. It will also discuss the management of venous eczema, including best practice in the use of emollient preparations.

"In both acute and chronic eczema, skin changes can lead to an increased risk of infection and reduction in the barrier function of the skin."

HEATHER NEWTON
Consultant Nurse Tissue Viability, Royal Cornwall Hospitals NHS Trust, Truro

Eczema is an itchy, inflammatory disorder of the skin (Cameron, 2007) and can be classified into acute or chronic eczema. Acute eczema presents as inflamed, itchy, wet skin that often has blisters visible on the skin surface. However, chronic eczema presents as dry, scaly patches of itchy skin. In both cases, skin changes can lead to an increased risk of infection and reduction in the barrier function of the skin.

Acute eczema can occur as a result of a contact allergy, whereas chronic eczema is more likely related to chronic disease, such as venous hypertension. In both cases, the skin reaction can range from mild to severe and as such the management plan will change accordingly. Venous eczema is common especially in older people and is reported to affect 20% of people over 70 years of age. Approximately 10% of people with varicose veins go on to develop skin changes (Nazarko, 2009)

Eczema and venous disease

Venous eczema may be present on the lower leg with or without the presence of ulceration. It may be the precursor to venous ulceration and, therefore, should be identified at an early stage by healthcare professionals to ensure preventative treatments are in place (Hoffman, 2010).

Monk and Graham-Brown (1992) suggested that varicose eczema coincides with underlying venous disease, however, how it develops and its relationship to venous dysfunction is unclear.

The venous system is made up of deep and superficial veins that are linked by perforator veins. Veins have valves that allow blood to travel either back to the heart or from the deep to the

superficial veins via the perforators (Anderson, 2008).

Venous hypertension occurs when the valves become damaged through trauma, surgery, venous thrombosis, pregnancy and obesity. Blood flows back into the deep veins causing an increased volume and a rise in pressure. This causes venous congestion, leading to a loss of nutrients and oxygen that cannot reach the skin and underlying tissues. Skin changes, such as eczema, occur as a result. As the veins become engorged, the walls of the veins stretch allowing fluid, proteins and red blood cells to leak out into the tissues. This causes skin irritation leading to venous eczema. Patients with venous leg ulcers show a greater tendency towards allergy than the general population because of this (Saap et al, 2004).

Signs and symptoms of venous eczema

As a result of the underlying disease process, the skin on the lower leg changes and the higher the degree of venous disease the more pronounced the skin changes can be. The inner aspect of the lower leg is the first to be affected (Rycroft et al, 2010). Chronic venous eczema appears as dry, scaly, itchy patches on the lower leg (*Figure 1*). The skin scales that are commonly seen are flakes of keratinised epidermal cells, which lie on the skin surface (Rycroft et al, 2010). With chronicity and prolonged inflammation, the scales become thickened and are often described as hyperkeratosis (All Wales TV Nurse Forum, 2014).

In the case of acute eczema, the skin becomes red, wet and itchy. Occasionally, there can be skin scaling depending on the chronicity of the venous disease. Acute eczema on the lower leg is often associated with a contact or irritant sensitivity reaction. It can often be difficult to determine whether the eczema is a result of an immune mediated allergic response or an irritant reaction (British Dermatological Nursing Group [BDNG], 2012). Patients with chronic venous eczema have an increased risk of sensitivity due to the impairment of the skin's natural barrier function (Cameron, 2007).

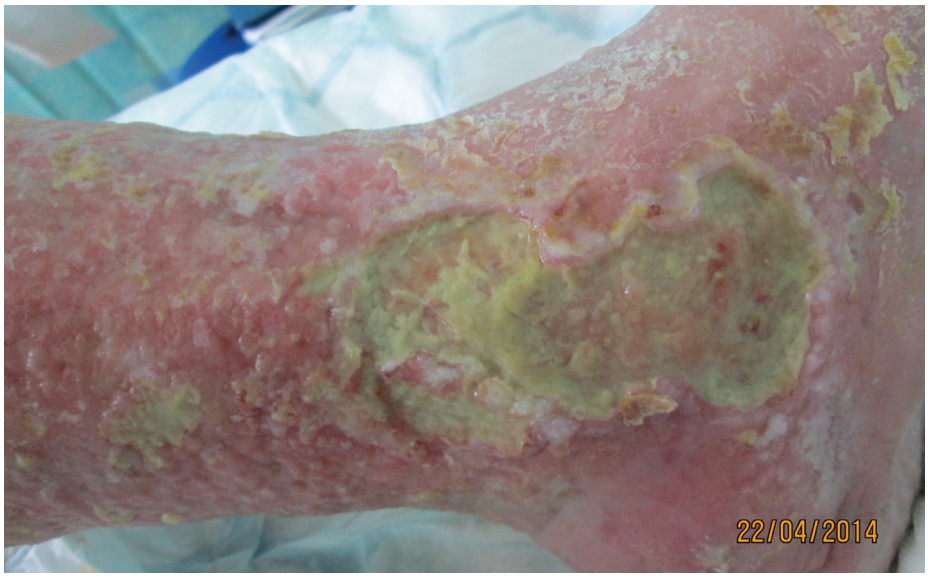

Figure 1. ***Patient with venous leg ulcer. Note dry, scaly, eczematous skin on leg.***

Wilson et al (1991) suggested that skin changes resulting from venous eczema impair the skin's natural barrier function and when occlusive dressings and bandages are applied to an area of vulnerable skin, this may create the perfect environment for the development of an allergic contact dermatitis.

Common leg ulcer allergens include hydroxybenzoates (also known as parabens) and chlorocresol, which are preservatives found in creams and wool fat, including lanolin used in some ointments. However, the newer types of lanolin-based emollients rarely cause adverse reactions (Stone, 2000). Propylene glycol is used in humectant emollients to help the skin absorb moisture and cetosteryl alcohol, which is an emulsifier also found in emollients, are both also potential sensitisers.

Management of venous eczema

The successful management of venous eczema is twofold and consists of treating the underlying venous hypertension and rehydration of the skin. If the underlying cause is not treated, the outcome of any other treatment regimen is unlikely to be successful.

Venous hypertension is best treated with compression therapy in the form of compression bandages, compression hosiery or compression garments. These increase blood flow through the veins and reduce pressure in the capillaries allowing fluid to drain from the tissues to reduce oedema. This, in turn, allows more nutrients and oxygen to be delivered to the skin reducing the risk and development of venous eczema (Anderson, 2008).

Alternatively, venous surgery in the form of foam sclerotherapy or venous ablation will block the incompetent veins and re-route the venous blood to the other healthy veins in the leg.

Venous eczema will improve with compression therapy because venous hypertension is reduced, however, the skin in the lower legs also benefit from the application of topical emollient

Figure 2. ***Selection of topical emollients.***

therapy. Research undertaken by Held et al (2001) suggests that emollients accelerate regeneration of the skin barrier function following disruption when the most lipid-rich emollients are used.

Emollient therapy

The term 'emollient' implies a material that softens and smoothes the skin both to the touch and to the eye (Loden, 2003). The aim of emollient therapy is to rehydrate the epidermis and, in particular, the stratum corneum, which is the top layer of the skin, and to reduce the signs and symptoms of dry skin, such as scaling and itching (All Wales TV Nurse Forum, 2014).

Emollients work either by occlusion, where moisture is trapped into the skin or by drawing moisture into the stratum corneum from the underlying dermis. The mechanism of action depends on the constituents of the emollient (Rawlings et al, 1994).

Occlusive emollients contain oils such as paraffin, which form a layer of oil on the skin to prevent moisture evaporation. They do not fully absorb into the skin, whereas humectant emollients penetrate into the stratum corneum where they attract and retain water. They contain substances such as urea or glycerine which, on penetration of the epidermis, they draw water in from the dermis (Loden, 2003).

There are also emollient preparations available to help with itching and also with added antiseptic properties to prevent infection (*Table 1*).

Emollient preparations are commonly found as creams, ointments and lotions, however, gels or mousses are also available (*Figure 2*). Ointments contain the highest number of lipids, which make them greasy, while creams are less greasy than ointments and, as such, are more acceptable to patients. However, creams contain preservatives and because of the higher risk of sensitisation as previously described they are best avoided on the lower legs of patients with venous disease. Lotions have a higher water content making them easier to absorb, however, they have a lower impact in the hydration of the skin.

The consistency of an emollient is affected by the type of lipid within it, such as oil or wax, the proportion of the lipid to water, the ambient temperature and what other additives are in the product (BDNG, 2012) They should, therefore, be prescribed to meet the individual's specific needs based on a full skin assessment and diagnosis of venous eczema. *Table 1* describes a selection of emollients, their constituents and where they should be used or avoided. This should be taken as a guide only as there are still many unanswered questions as to exactly which emollient should be used, how frequently they should be applied, where and when they should be applied and how to use them alongside other therapeutic products (BDNG, 2012).

Emollients should be prescribed depending on the individual requirements needed to rehydrate the skin. Emollient wash products include soap substitutes that reduce the drying effects caused by off-the-shelf soap products, as well as bath/shower additives that are either added to water or used in the shower. These are mainly oil-based, fragrance-free and non-foaming and aim to reduce the drying effects of water by leaving a layer of oil on the skin. Some emollient wash products have anti-microbial properties for skin that is infected, however, they should not be used routinely for non-infected skin (Primary Care Dermatology Society and British Association of Dermatologists, 2006).

It is important that healthcare professionals recognise that emollients should be applied as soon as possible after the skin has been bathed to ensure that the moisture is trapped against the skin and not lost through evaporation. The use of emollient wash products are an essential part of the complete emollient package of care and patients should be educated on their effective use.

'Leave-on' emollients, such as ointments and creams, are designed to be applied to the skin and left in place to begin hydrating the skin. They should be applied on a regular basis to

Table 1. Emollient preparations (this list is not exhaustive). Adapted from the Joint Formulary Committee, (2007).

Emollient	Indications	Comments
Aqueous cream	Soap substitute	Originally developed as a soap substitute and not a leave-on emollient. Has a high water content, which makes it less effective for dry skin. Moncrief et al (2013) identified that aqueous cream showed potential damage to skin with compromised barrier function when used as a leave-on product
Diprobase® (Schering-Plough)	Leave-on occlusive emollient. Ointments should be used for patients with venous eczema	Avoid the cream in venous eczema as it contains preservatives that may cause reactions
Doublebase™ (Dermal Laboratories)	Leave-on occlusive product with emollient and humectant properties. Range of bath, shower and wash products, as well as gel. It has a high oil content	Doublebase Dayleve gel is particularly effective when patients are unable to apply frequently as it has high oil and glycerol content
Epaderm™ (Mölnlycke Health Care)	Leave-on emollient available in cream and ointment. It can also be used as a soap substitute	Contains cetostearyl alcohol, which can be a potential sensitiser
E45 (Forum Health Products Limited)	Leave-on emollient available as a cream or lotion	Contains hypoallergenic lanolin, parabens and cetostearyl alcohol; all are potential sensitisers in venous leg ulcer patients
50/50 white soft paraffin and liquid paraffin	Leave-on emollient. Dry, scaly skin. Suitable under compression bandages. Very greasy so patient acceptance unless occluded is low	Paraffin-based emollients pose a fire risk, especially when used in high quantities
Hydromol® (Alliance Pharmaceuticals)	Highly occlusive leave-on emollient. Available as an ointment, cream, bath and shower emollient and an intensive emollient with 10% urea	Contains no fragrances, colour of preservatives, but does contain cetostearyl alcohol. Avoid the intensive Hydromol on moist or broken skin as may cause skin irritation
Balneum® (Almirall Limited)	Balneum is a humectant leave-on emollient, which contains 5% urea	Urea is not an allergen as it is found naturally in the skin.
Balneum® Plus (Almirall Limited)	Balneum Plus contains urea and lauromacrogols, which help to sooth and relieve itchy skin	Urea is not an allergen as it is found naturally in the skin. Lauromacrogols have properties of a topical anaesthesia and anti-pruritic
Dermol® (Dermal Laboratories Limited)	Antimicrobial emollient. Available as a wash, shower, bath, lotion and cream	It is advisable to stop Dermol preparations when the infection has cleared. Contains cetostearyl alcohol

maintain their effectiveness and also prescribed in sufficient quantities to provide an effective occlusive barrier to prevent water loss (Joint Formulary Committee, 2007). It is recommended that between 250–600 g of emollient is used weekly, depending on the dryness of the skin. For patients with venous eczema where application is to the legs only, between 50–100 g may be a more realistic amount per week especially if they are in compression bandages which may be changed 2–3 times weekly.

Topical steroids can also be effective in the management of venous eczema in the acute phases. Steroids reduce inflammation that is often associated with venous eczema, however, they should only usually be prescribed for a maximum of 2 weeks (Langoen and Lawton, 2009). Once the inflammation settles, the steroid preparation should be reduced gradually and then stopped. There is still a debate regarding whether or not the emollient or the steroid preparation should be applied first (BDNG, 2012). In cases of extremely dry inflamed skin, the emollient would usually be applied first to soften the skin prior to application of the topical steroid. However, if an occlusive emollient is used this may affect the absorption of the steroid, unless enough time is left in between applications.

Summary

Venous eczema can be challenging to manage partly because of the intensive regimen of skin care that is required. The skin must be rehydrated to reduce the itching and dryness and also to prevent secondary infection. A robust emollient regimen will ensure the skins barrier function is not compromised and together with effective compression therapy the venous eczema should be able to be controlled. Each patient should be treated on an individual basis as there may not be one emollient preparation that suits everyone's specific needs. WE

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