

## Promoting Evidence-Based Nursing Practice: *Managing clients with a venous leg ulcer: Keeping the pressure on*

### Introduction

It is reported that approximately 1-2% of persons will develop a chronic lower leg ulcer (Stacey et al, 2002). Whilst chronic lower leg ulceration occurs most commonly in older adults, it also affects a small proportion of younger adults (Hewitt et al, 2003). Statistics cite venous insufficiency due to venous hypertension as responsible for between 55-70% of leg ulcers (Hewitt, et al, 2003; Rice, 2002). Treatment of venous leg ulcers is aimed at promoting the return of fluid from the tissues into the vascular and lymphatic systems and facilitating venous return through support of the veins (Hofman, 1998). This is achieved through the application of graduated compression to the lower limb/s.

### Factors influencing venous return

Effective venous return from the lower limbs is dependent on a number of factors. Pressure exerted by the calf muscles during exercise (calf muscle pump) is very efficient in promoting venous return (Vowden & Vowden, 1998). In persons with limited capacity to walk or exercise, efficient venous return is impaired (Rice, 2002). In order to maximise the action of the calf muscle pump, a functioning ankle joint and using a 'heel-toe' walking action is necessary. Finally, patent valves in the veins will prevent back flow of blood (Vowden & Vowden, 1998). Several conditions will predispose a person to venous insufficiency. Immobility of a limb, pregnancy, long periods standing and severe heart failure may result in prolonged venous hypertension, leading to venous insufficiency (Vowden & Vowden, 1998). Deep vein thrombosis, pulmonary embolism, venous surgery or fracture of a leg are also predisposing factors for venous insufficiency due to the potential for damage to the veins and/or valves (Harker, 2002)

### The science of compression therapy

A comprehensive assessment of the person with an ulcer is necessary to determine ulcer aetiology. Significant arterial disease must be excluded prior to the instigation of compression therapy as compression may reduce poor arterial blood flow to dangerously low levels (Stacey et al, 2002). In the absence of clinically significant arterial disease, graduated compression therapy is recognised as the definitive treatment for venous leg ulcers (Fletcher, Cullum & Sheldon, 1997, Stacey, 2002). When correctly applied, compression garments provide a rigid casing around the leg. This overcomes the effects of high hydrostatic pressure within the veins (Thomas & Nelson, 1998) and enhances the action of the calf muscle pump, thereby enhancing venous return. Hydrostatic pressure is greatest at the ankle and decreases up the limb, therefore the greatest level of compression is required at the ankle (Thomas, 1996).

A compression pressure of 30-40mmHg at the ankle is optimal for treatment of venous leg ulcers, graduating to 15-20mmHg at the top of the calf (Thomas & Nelson, 1998a, Rice, 2002). A compression pressure of less than 20mmHg at the ankle is generally unsuitable for reducing existing oedema and is ineffective for use on persons with large limbs (Thomas & Nelson, 1998a). Compression pressure of less than 15mmHg at the ankle is regarded as insufficient to provide any enhancement to venous return (Negus, 1991).

### Choosing a compression therapy system

There are a number of compression therapy systems available. These include multi-layer bandages, short stretch (inelastic) bandages, long stretch (elastic) bandages and hosiery. A review of the literature undertaken by Cullum et al. in 1998 concluded that "there is no basis for advocating any one particular high compression system". However, there is some evidence that multi-layer bandage systems are more effective than single layer systems (Nelson & Thomas, 1998). Choice of a compression bandage system is made giving consideration to client factors, availability, cost, ability to re-use, ease of application and the skills of the user.

Dressings are generally required over the ulcerated area/s to manage exudate and provide a moist wound environment. The type of dressing chosen should be suitable for use under compression (ie one that 'locks' exudate within the dressing). Initially an absorbent dressing may be required due to high levels of exudate. As compression reduces oedema, the level of wound exudate usually decreases and dressing choice may require reassessment.

### Considerations in applying compression

The compression level achieved is dependent on Laplace's law. This states that sub-bandage pressure is dependent on the tension of the bandage during application, the diameter of the limb and the number of layers applied (Thomas & Nelson, 1998). In practical terms this means that when a bandage is applied using constant tension to a limb with a gradually increasing diameter from the ankle to the calf, graduated compression will result (Thomas & Nelson, 1998). It is therefore important to use extra undercast padding for ankles of less than 18cm diameter (Mear & Moffatt, 2002), slender calves, or legs with a narrow gaiter area ('champagne bottle leg'). Extra padding may also be necessary over bony prominences such as the tibial plateau, malleoli and Achilles tendon. Other considerations include:

- If possible apply compression early in the day when oedema is less.
- Any compression system should extend from the base of the toes to the top of the calf (just below the knee) and include the heel.
- Position the foot at 90° during application of compression bandages. This will prevent 'bunching' of the bandages at the top of the foot during flexion.
- Cut off excess bandage if the bandage is too long. Winding a bandage around a limb multiple times at calf level or bandaging back down the limb may have a tourniquet effect.
- Use more than one bandage if necessary for large or long limbs. Inadequate overlap will reduce the compression level.
- Follow manufacturer's recommendations for application and care of compression garments. Training in compression bandage application is recommended. The skill level of the user can significantly affect the compression level achieved (Stockport et al, 1997).

### Reduced compression

A reduced level of compression may be used in certain instances. However, to effectively enhance venous return a

sustained compression at least 15mmHg is necessary. Criteria for using a reduced level of compression includes: when first commencing compression to enhance client compliance; where there is a mild degree of arterial impairment (Morison & Moffatt, 1994); or when the client is resistant to or states they cannot tolerate any greater level of compression. Clients who have considerable leg discomfort without significant arterial disease may find their tolerance for compression increases as their oedema reduces.

### Compression systems

**Four layer bandage systems:** This uses four layers of bandage: undercast padding, crepe bandage, light elastic bandage and cohesive bandage. Only layers three and four apply compression of 17mmHg and 23mmHg respectively (Smith & Nephew, 2002). Correctly applied, a four layer compression bandage system will maintain 40mmHg at the ankle for one week (Fletcher, Cullum & Sheldon, 1997).

**Short stretch bandages:** This system uses an inelastic bandage (< 50% stretch ability) applied over undercast padding. Short stretch bandages provide a reduced pressure when the client is resting and a high pressure when the client is exercising (Mear & Moffatt, 2002). This type of bandage is often better tolerated overnight than a long stretch bandage due to the low resting pressure. Due to the inelasticity of the bandage, frequent re-application may be necessary in the presence of oedema (Thomas & Nelson, 1998a).

**Long stretch bandages:** This system uses an elastic bandage (> 50% stretch ability) applied over undercast padding. Long stretch bandages provide high pressures at rest and during exercise. Many of these bandages have shapes printed on them which alter when stretched to assist the user to achieve the correct level of compression.

**Zinc paste bandages:** Whilst they do not provide compression, zinc paste bandages can be very effective in treating lower limb eczema associated with venous disease (Morison & Moffatt, 1994). They may be applied directly over the ulcer and a compression bandage used over them. There are several different types of zinc paste bandages available. Some have additives such as calamine, ichthammol or coal tar. Some zinc paste bandages may constrict in certain conditions and are therefore applied using a method of 'folding back' the bandage (Morison & Moffatt, 1994). It is important to check the manufacturer's recommendations for application.

**Hosiery:** Stockings are available in a range of compression levels, styles and colours. These are generally used once a venous leg ulcer has healed (Jones, 1998). Compression controls venous insufficiency, it does not cure it. A lifetime of wearing compression stockings is recommended to prevent recurrence of the clinical symptoms of venous insufficiency and possible re-ulceration (Jones, 1998).

### Client education

The nurse and client work together toward healing. It is important that clients understand the basic physiology of venous disease, the benefits of compression therapy and how this will assist in ulcer healing. Exercise is important as this facilitates the action of the calf muscle pump and enhances venous return. Specific exercises to maintain maximum flexion of the ankle joint may also be

recommended. When resting, elevation of the lower limbs will reduce venous hydrostatic pressure. Jones (1998) recommends provision of verbal and written information with reinforcement as required. Providing clients with information on how to care for their garments, including any specific washing instructions will ensure correct compression levels are maintained. Discussing strategies with clients on ways to keep garments dry whilst bathing will minimise potential skin breakdown from wet garments and the need for extra garment changes.

### Summary

A comprehensive assessment of the client with a leg ulcer is imperative to confirm ulcer aetiology. Graduated compression therapy is the definitive treatment for venous leg ulcers. The ability to utilise compression therapy requires knowledge and skill. Implementation of a sound, evidence-based treatment plan in conjunction with the client can achieve a positive outcome.

### References

- Cullum, N., Fletcher, A.W., Nelson, E. A. & Sheldon, T.A. 1998, *Compression bandages and stockings in the treatment of venous leg ulcers*, The Cochrane Library, Issue 4.
- Fletcher, A., Cullum, N. & Sheldon, T.A. 1997, *A systematic review of compression treatment for venous leg ulcers*, British Medical Journal, Vol. 315, September, pp. 576-580.
- Harker, J. 2002, *Promoting best practice in leg ulcer assessment*, Nursing Times Plus, Vol. 98, No. 44, pp. 60-61.
- Hewitt, A., Flekser, R., Harcourt, D. & Sinha, S. 2003, *The evolution of a hospital based leg ulcer clinic*, Primary Intention, Vol. 11. No. 2, pp. 75-85.
- Hofman, D. *Oedema and its treatment*, Journal of Wound Care (supplement), July.
- Jones, J. 1998, *Compression, ulcer recurrence and compliance*, Journal of Wound Care (supplement), October.
- Mear, J. & Moffatt, C. 2002, *Bandaging technique in the treatment of venous ulcers*, Nursing Times Plus, Vol. 98, No. 44, pp. 44-46.
- Morison, M. & Moffatt, C. 1994, *A Colour Guide to the Assessment and Management of Leg Ulcers*, Mosby, London.
- Negus, D. 1991, *Leg Ulcers: A Practical Approach to Management*, Butterworth-Heinemann, Oxford.
- Nelson, A. & Thomas, S. 1998, *Selecting bandages*, Journal of Wound Care (supplement), September.
- Rice, J. 2002, *Handy hints when treating venous leg ulcers and using compression therapy*, Primary Intention, Vol. 10, NO. 3, pp. 129-134.
- Smith & Nephew, 2002, *Profore: Four Layer Bandage System. Guidelines: Venous Leg Ulcer Treatment*.
- Stacey, M. 2002, *Compression therapy in the treatment of venous leg ulcers*, Nursing Times Plus, Vol. 98, No. 36, pp. 39-43.
- Stacey, M., Falanga, V., Marston, W., Moffatt, Phillips., Sibbald., Vanscheidt, W. & Lindholm, C. *The use of compression therapy for the treatment of venous leg ulcers: A recommended management pathway*, EWMA (European Wound Management Association) Journal, Vol. 2, No. 1, pp 3-7.
- Stockport, J.C., Groarke, B.A. Ellison, D. A. & McCollum, C. 1997, *Single-layer and multilayer bandaging in the treatment of venous leg ulcers*, Journal of Wound Care, Vol. 6, No. 10, pp. 485-488.
- Thomas, S. 1996, *High compression bandages*, Journal of Wound Care, Vol. 5, No. 1. pp. 40-43.
- Thomas, S. & Nelson, A. 1998, *Graduated external compression in the treatment of venous disease*, Journal of Wound Care (supplement), September.
- Thomas, S. & Nelson, A. 1998a, *Types of compression bandage*, Journal of Wound Care (supplement), September.
- Vowden, K. & Vowden, P. 1998, *Anatomy, physiology and venous ulceration*, Journal of Wound Care (supplement), July.