

HOW TO APPLY EFFECTIVE MULTILAYER COMPRESSION BANDAGING

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Compression therapy is essential to improve the healing rates of venous ulcers (Cullum et al, 2001) and other lower limb lesions, such as pre-tibial lacerations. Knowledge of compression theory and a good application technique is essential if the therapy is to be effective and safe. Within the UK, the multilayer bandage is probably the most common bandage system used. This article describes how to select and apply a multilayer compression bandage system safely to an average-sized limb (ankle width 18–25cm).

Venous ulceration and the accompanying skin changes, e.g. venous staining, varicosities and ankle flare, are caused by venous hypertension (*Figure 1*). Graduated compression therapy, helped by the calf-muscle pump, helps to reverse this process and thus aids healing (Thomas, 1998). There are various types of compression bandage therapy available which can be confusing to the novice practitioner who has to decide which bandage is indicated for the specific needs and lifestyles of individual patients (*Figure 2*).

All bandages are classified according to their properties:

- ▶▶ Type 1: conforming or retention bandages
- ▶▶ Type 2: light support bandages
- ▶▶ Type 3: compression bandages. These can be subdivided further, depending on the amount of compression that they apply to average ankle widths (18–25cm).

The sub-bandage pressure (see glossary) is measured in mmHg:

- ▶▶ Type 3a: light compression (14–17 mmHg)
- ▶▶ Type 3b: moderate compression (18–24 mmHg)
- ▶▶ Type 3c: high compression (25–35 mmHg) (Thomas, 1998).

Compression bandages can be divided into elastic (long-stretch) and inelastic (short-stretch) as described by Anderson on p.20–37.

The multilayer system that this article describes is made up of elastic bandages and wadding and has been commonly described as the ‘four-layer system’. However, this term is no longer considered helpful because it is essential that the practitioner knows which type of bandages make up the chosen system for his or her patient. Multilayer doesn’t describe which

bandages are used, and such systems do not always comprise four layers.

Key features of compression theory

There are key features of compression theory that practitioners need to understand if they are to apply compression therapy safely and effectively:

- ▶▶ Sub-bandage pressure is the pressure that the limb receives from the bandage. When applied correctly, the following variables will increase the sub-bandage pressure:
 - ▶▶ The smaller the circumference of the limb
 - ▶▶ More compression bandage layers
 - ▶▶ The greater the bandage tension (i.e. the pressure from a type 3c bandage is greater than 3a)
 - ▶▶ The ankle width is very important in determining the sub-bandage pressure

and thus measurement is an essential part of assessment and management decisions (Figure 3). A large limb will automatically receive less compression and thus the bandage will be ineffective.

- ▶▶ High compression therapy is more effective at healing than light compression, and the aim is to achieve a pressure measurement of approximately 40mmHg at the ankle (Thomas, 1998)
- ▶▶ The practitioner needs to assess the limb before application, establishing whether the limb has a normal shape (e.g. thin ankle and wider calf). Wadding may need to be used under the bandage to restore the correct limb shape
- ▶▶ Inappropriate use of high compression can cause pressure damage; thus, it is essential that an ankle brachial pressure index (ABPI) is performed to exclude significant arterial disease. The ABPI must be greater than 0.8 before high compression can be applied (Thomas, 1998). For more info on obtaining an ABPI, see p. 54–60
- ▶▶ Before applying any compression bandage, it is essential that you are taught by a competent practitioner.

Application

Before application you need to consider the following:

- ▶▶ Have local guidelines been followed with regard to assessment and documentation?
- ▶▶ Has the skin condition been managed? Ensure the limb has been soaked in warm water and emollient



Figure 1. Venous ulceration and the accompanying skin changes.



Figure 2. A selection of the various bandages available.



Figure 3. Ankle measurement is an essential part of patient assessment.



Figure 4. Sub-bandage wadding is applied in a spiral fashion, toe to knee.



Figure 5. Crepe bandage is applied in a spiral fashion, to flatten the wadding.



Figure 6. Type 3a bandage is applied using a figure of eight technique. Tension is checked using two fingers.

- » Has pain been managed effectively? Patients will not tolerate the compression bandage if analgesia is not adequate
- » Has the equipment, patient and environment been prepared properly?

If the answer is 'yes' to all of the the above, then the application of compression therapy can proceed. However, patient-practitioner partnership is essential. If compression bandaging is not being tolerated, the practitioner needs to explore with the patient the reasons why (Edwards, 2003) and refer the patient to a specialist if required.

For a limb that has an ankle width of 18–25cm, the following multilayer compression system is suitable:

- » One layer of sub-bandage wadding
- » One layer of crepe
- » One layer of type 3a bandage
- » One layer of type 3b bandage.

If the ankle is greater that 25cm or less than 18cm, alternative bandage regimens are required (Moffatt, 2005). Please check local guidelines for assistance and referral.

Applying compression bandaging

1. The leg is washed in warm water with emollient. Hyperkeratosis is removed with a soft cloth and further emollient applied, such as a 50% white soft paraffin mixture.
2. The dressing of choice is applied to the limb. In most instances, a simple non-adherent dressing is sufficient. Tubular gauze can be applied if

- the wadding irritates the skin.
3. The sub-bandage wadding is applied in a spiral fashion, toe to knee, for protection of bony prominences and exudate absorption (*Figure 4*). This is considered to be the first layer of the multilayer system. Sub-bandage wadding must always be used under compression bandages. The wadding protects the tibial crest or shin, and Achilles tendon. However, care must be taken not to use too much padding, as this will increase the limb width significantly.
 4. The crepe bandage is applied in a spiral fashion, toe to knee. This will flatten the wadding layer and aid absorbency (*Figure 5*). This is considered to be the second layer of the system.
 5. Next comes the compressive third and fourth layers. It is essential that the correct technique and pressure is used, ensuring 50% stretch and 50% overlap. Apply all bandages from the base of the toes to 1cm below knee space. The ankle should be dorsiflexed ('toes to the nose') or at a 90 degree angle; this will prevent creasing of bandages over the dorsum or the front of the ankle which is a common cause of pain and lack of compliance.
 - ▶▶ The first layer of the compression therapy — type 3a bandage — is applied using a figure of eight technique. Note ankle position and do not over-extend the bandage. Check the tension is correct using two fingers (*Figure 6*).
 - ▶▶ The second layer of the compression therapy — the type 3b bandage — is then



Figure 7. The type 3b bandage is then applied in a spiral fashion with 50% overlap.

- applied in a spiral fashion. Check that the calf is fully enclosed with the calf muscle covered completely (*Figure 7*).
 - 8. Now check for comfort and that footwear can be worn. This type of multilayer system has the potential to be very effective but it is not suitable for all patients as it can feel unduly bulky, hot and restrictive. If that is the case, seek advice for an alternative solution. The patient should be aware of signs of poor perfusion and told to remove the top compression bandage and inform their nurse if the following signs are present:
 - ▶▶ Pins and needles sensation over toes
 - ▶▶ Numbness or discolouration of the toes
 - ▶▶ New pain.
- Evaluation and review**
- The frequency of the bandage change is dictated by exudate and exudate strike through, pain at ulcer site and lifestyle. Most commonly, the dressing and bandage system is changed once

or twice a week. At review, the bandage system's effectiveness with regard to ulcer healing and oedema reduction should be assessed. If any signs of compression damage are found, such as linear signs of redness or, in severe cases, necrotic tissue, commonly appearing down the shin or over the front of the ankle, it is essential that this is documented and the cause established. Specialist review is required if the ulcer is not responsive or pain is severe.

The multilayer compression bandage system can be too bulky and hot for some patients; if this is the case it is essential that further advice is sought because there are other effective bandage systems available. Compression therapy needs to be used until the ulcer heals and until the patient has received compression hosiery. The latter is essential to help prevent the ulcer from recurring. **WE**

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Glossary

Graduated compression: the aim is to provide approximately 40mmHg pressure at the ankle, reducing to 20mmHg at the calf. This is automatically obtained on a 'normal' shaped leg because the ankle is narrower than the calf.

Sub-bandage pressure: this is the pressure the limb receives from the bandage and is governed by Laplace's equation which states that the applied pressure is proportional to the bandage tension but is inversely proportional to the width or curvature of the limb (Moffatt, 2005).

MYTH BUSTER

Q When should foam dressings be used?

A There is a large range of foam dressings available — all with slight variations in their method of working. However, they are generally recognised as all-purpose dressings which have been designed to absorb moderate to high volumes of exudate. Their versatility is further enhanced by the large variety of sizes, non-adhesive or adhesive properties and their ability to be cut and shaped to mould and fit difficult areas.

It is generally felt that the versatility of foams and the fact that they are easy to use often means they are used inappropriately and ineffectively.

Foam dressings are designed for moisture control and are primarily designed to absorb exudate or fluid from the wound. This may be in the form of a primary dressing or as a secondary dressing that works in conjunction with a primary dressing.

Q When should foam dressings not be used?

A If there is little or no exudate. Small non- or low-adherent dressings should be selected instead:

- ▶▶ To cover a wound temporarily, e.g. when transferring from bathroom to bed or while awaiting review by other members of staff. In this case a low or non-adherent dressing can be used. Burns and dermatology units have historically used Clingfilm for wounds that cover large surface areas of the body.

When using foams in the future, consider:

- ▶▶ How much exudate is coming from the wound – non-exuding wounds or wounds with a low volume of exudate do not require a foam dressing
- ▶▶ Could a low or non-adherent dressing be used instead of a foam dressing for a short-term or temporary cover for patient transportation or while awaiting review?