# KTwo® Compression Bandage System Easy Volume 4 | Issue 1 | February 2013 www.woundsinternational.com



# Introduction

Compression therapy has been considered the gold standard of care for venous hypertension and leg ulcers since the late 1980s<sup>1</sup>. As research has translated into clinical practice, bandage application practices have changed and improved, reducing healing times and increasing patient comfort and wellbeing. The KTwo® compression bandage system (Urgo Medical) has been designed to make application easy, provide effective levels of compression and achieve good patient concordance. This Made Easy describes the role of the KTwo range in the management of venous leg ulcers and reviews the latest clinical evidence supporting its use.

Authors: Young T, Connolly N, Dissemond J. Full author details can be found on page 6.

# What is an effective therapeutic level of compression?

The effective therapeutic level of compression recommended for venous leg ulcer management is an average pressure of at least 40mmHg at the ankle<sup>1</sup>. The degree of compression produced by any bandage system over a period of time is determined by a number of complex interactions between the physical structure and properties of the bandage, the size and shape of the limb to which it is applied, the skill and technique of the bandager, and the nature of any physical activity undertaken by the patient<sup>1</sup>.

Compression bandaging may contain elastic or inelastic materials or a combination of both (Box 1). The aim is to correct, as far as possible, the effects of incompetent valves and reduce the damage to veins in the leg caused by venous hypertension by creating a stiff, but shaped container against which muscles in the calf can contract. Elastic bandages are rarely used in isolation as they provide little or no stiffness. Stiff bandaging may be achieved by using either inelastic bandages or elastic bandages in a multicomponent system<sup>2</sup>. Such systems generate a high 'working' pressure during walking, while maintaining a lower 'resting' pressure during inactivity. The difference between the working and resting pressures is known as the static stiffness index (SSI) (Box 2).

A Cochrane review on compression has concluded that multicomponent bandage systems are more effective than singlecomponent bandage systems in healing venous leg ulcers<sup>3</sup>. In addition, multi-component systems (bandages or stockings) appear to perform better when one component is an elastic bandage.

## **Box 1** Difference between elastic and inelastic bandages

**Elastic bandages**, sometimes referred to as long-stretch, contain elastomeric fibres and are capable of stretching and returning to almost their original size. They can sustain pressure for up to a week due to their ability to accommodate changes in limb shape and movement<sup>1</sup>.

**Inelastic bandages**, sometimes referred to as short-stretch, contain few, or no, elastomeric fibres and have minimal extensibility. These bandages can achieve higher working pressures and lower resting pressures<sup>1</sup>.

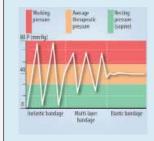
# Challenges in maintaining effective compression levels

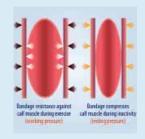
One of the benefits of using compression with a high SSI is that it often results in a rapid reduction of oedema. However, this may be associated with an increased risk of slippage due to the bandage's inability to accommodate changes in limb shape, which often requires frequent bandage re-application to maintain an effective level of compression. In addition, the level of clinical knowledge and experience of the practitioner applying the system can also have an effect on the level of compression and therapeutic outcome<sup>1</sup>.

Clinicians should develop a healthy respect for the skills and knowledge required for bandage application, and avoid becoming so concerned about the potential risks that they apply insufficient levels of compression to be effective. Training should be given to reduce problems associated with poor application technique such as pressure damage, limb distortion, bandage slippage and ineffective pressure levels. There is some evidence to suggest that the use of bandage

### Box 2 Static stiffness index (SSI)

Bandage stiffness can be measured using the static stiffness index (SSI) – that is the change in sub-bandage pressure that occurs when a patient moves from a lying to a standing position. Inelastic bandages have a high SSI and are able to remain rigid due to their lack of extensibility. This enables them to resist changes in the geometry of the calf muscle during exercise and to generate high pressure peaks of 60–80mmHg during walking (the working pressure). These pressure peaks create intermittent, short duration venous occlusions, which are thought to reduce venous reflux and lower venous hypertension. When the calf muscle pump is at rest (eg when the patient is lying down), pressure peaks do not occur and the resting pressure is lower². Elastic bandages have a low SSI and provide a constant pressure, maintaining a therapeutic level of compression at rest.





# KTwo® Compression Bandage System Easy



Figure 1 The KTwo compression bandage system uses the PresSure System to achieve the:

Correct Size + Correct Stretch + Correct Overlap = Correct Pressure

The integral pressure application guides can be used when training nurses and provide a visual proof that the correct level of pressure has been applied to the limb. This aids safe compression and allows consistency of care<sup>2</sup>



pressure indicators can increase the ability of those applying bandages to apply effective therapeutic levels of pressure<sup>4,5</sup>.

In addition, patients and carers should be supported clinically at home to enable them to apply bandages effectively as soon as the patient gets out of bed and before oedema begins to accumulate. This may facilitate independence, although in practice, few patients can adequately self-bandage.

A delay in introducing a therapeutic level of compression of even one month may slow the wound healing process and prolong symptoms such as pain. However, some compression is better than no compression and a staged introduction (from reduced to full compression) may improve concordance for some patients<sup>6</sup>.

# What is the KTwo compression system?

The KTwo compression bandage system was launched in April 2007 and consists of two dynamic layers or components (Box 3), which are designed to be used together:

KTech is an inelastic (short-stretch) bandage (approximately 75% extensibility), which combines viscose and polyester wadding with a polyamide and elastane knitted layer. It is designed to be in contact with the skin, spreading the pressure uniformly over the surface of the limb and combines compression with protection and absorbency. As an inelastic bandage, it provides a high working pressure with a low resting pressure which creates a massage effect, improving venous return and reducing oedema levels<sup>7</sup> (Box 2).

KPress is an elastic (long-stretch) cohesive bandage (approximately 160% extensibility), comprising acrylic, polyamide, elastane and low levels of natural latex (a latex-free version is also available). This outer bandage provides the additional compression necessary to achieve the required therapeutic pressure and maintains the recommended resting pressures necessary to maintain improved blood flow. The cohesive nature of KPress keeps the system in place for up to seven days, reducing any risk of slippage and the need for re-application and additional nursing time8.

# **Box 3 Layers or components?**

The terminology surrounding the use of layers can be particularly problematic and should not be used to make assumptions about pressure levels. As there will always be some overlap when applying bandages, giving at least two layers of material at any point on the bandaged leg, a single-layer bandage cannot exist. The term components is therefore a better way to describe the individual products used to create a compression system (eg wool padding, elastic/inelastic bandages)<sup>6</sup>.

# Using pressure indicators to achieve therapeutic levels of compression

The KTwo compression bandage system uses the PresSure System, which is designed to help clinicians achieve optimal levels of compression consistently. All kits are printed with an oval pressure indicator, which becomes a circle when the correct bandage stretch is achieved. By overlapping the bandage to the bottom of the pressure indicator, a consistent 50% or two-thirds overlap can be achieved, depending on kit size and ankle circumference (Figure 1).

Pressure indicators printed on the bandages have been shown to aid safe application with accurate pressures being achieved consistently by the whole clinical team in both the hospital and community setting with minimal training<sup>4</sup>. In trials, 85% of nurses achieved the recommended pressure of 30–50mmHg on first application of KTwo despite being unfamiliar with the system and the mean pressure of 40mmHg did not change between the two successive applications<sup>4</sup>. The ease of applying the KTwo compression system and the conformability of both bandages also helped to reduce bandage application time<sup>4</sup>.

# Indications for the KTwo compression system

KTwo provides an average ankle pressure of 40mmHg and is designed to treat venous leg ulcers in patients with an ankle brachial pressure index (ABPI) of greater than 0.8 and to reduce associated chronic venous oedema. KTwo Reduced is designed to provide a lower level of pressure (average ankle pressure of 20mmHg), which is recommended for patients with mixed venous and arterial aetiology leg ulcers<sup>6</sup>. Both bandage systems are available in two kit sizes, 18–25cm and 25–32cm for different ankle circumferences, to ensure correct pressure application. A latex-free option is also available for both indications and in both sizes. The KTwo range has also been used successfully in the treatment of pretibial lacerations<sup>9,10</sup> and chronic lymphovenous oedema<sup>11</sup>.

# **Contraindications**

KTwo is contraindicated for patients with an ABPI of less than 0.8 and KTwo Reduced is contraindicated for patients with an APBI of less than 0.6 (subject to local protocols). The KTwo range is also contraindicated for known or suspected arterial disease, diabetic micro-angiopathy and ischaemic phlebitis. For patients with a contact allergy to latex, the latex-free version should be selected.

# Choosing the correct compression system

Following a thorough patient assessment, clinicians should identify goals of care and treatment options. The choice of the correct compression system is vital to ensure a therapeutic level of compression is delivered based on the patient's arterial blood flow to the limb. A Doppler ultrasound is the standard tool for vascular assessment<sup>12</sup>. All patients with an ABPI of less than 0.8 should be referred for specialist assessment and compression should not be used if there is significant arterial disease<sup>12</sup>. The World Union of Wound Healing Societies<sup>6</sup> recommend staging the compression therapy and commencing with lower levels, building up to higher levels of pressure, in certain populations. Unlike some other systems that require the addition of extra components to increase the level of compression, the KTwo range can provide both reduced or full compression therapy using a simple two-component system.

Before applying compression it is important to ask:

- How much pressure is required?
- What is the patient's ankle circumference?
- Which length of bandage is required?

This will determine the choice of kit required. KTwo compression bandages are produced in 8cm, 10cm, and 12cm widths. The 8cm and 12cm kits are for full leg bandaging where oedema is present. The 25–35cm kits have longer length bandages to accommodate the larger leg. All kits are for single use only.

# **Applying KTwo compression for leg ulcers**

The technique for applying the KTwo compression bandage system can be found online (see Box 4, page 6). It is safe and easy to apply with minimal training required.

# **Below-knee bandages**

- Before applying the bandages, place the foot at right angles to the leg (ask the patient to point toes to his/her nose). Ensure the wadding side of the KTech component is next to the skin and the pressure indicator is at the top edge, towards the patient. Anchor in place with one or two turns at the base of the toes and secure the heel with a figure of eight. Ensure the foot and heel are fully enclosed.
- For patients with an ankle circumference of 18–25cm, apply the KTech in a spiral up the leg from the ankle using a 50% overlap. Stretch the pressure indicator to form a circle and overlap the bandage so the pressure indicator is just covered. Finish bandaging 2cm below the popliteal space and cut off any excess bandage.
- Apply KPress over the KTech component using the same application technique. A small border of KTech should be visible at the toes and behind the knee to improve patient comfort.
- For patients with an ankle circumference of 25–32cm, the same application technique should be used, but with a two-thirds overlap. The pressure indicator is printed in the centre of the bandage to facilitate this.

# **Full-leg bandaging**

- Use the same application technique as below-knee, but apply the KTech (10cm width) to just above the knee, which should be slightly flexed. Padding may be required behind the knee for comfort. Continue to bandage to the top of the thigh with KTech (12cm width) and secure with tape.
- When there are high levels of oedema, apply the 8cm width bandage to the foot to just above the malleolus. Continue with the 10cm width to above the knee and 12cm width to the top of the thigh.
- Apply KPress over the top using the same application technique as above and press down gently to ensure full cohesion and secure with tape if necessary.

The KTwo compression system should be left in place until the next dressing change, ideally up to seven days.

# Why select the KTwo compression system? Design

The first component (KTech) is equal to the first three components of a standard four-component compression system and offers protective padding, extra absorbency and 80% of the compression. This reduces the need for supplementary bulky absorbents under the system and negates their potential for additional weight within the system, which, along with gravity, can cause bandage slippage. The decreased bulk allows for greater flexibility of the ankle and subsequently an increase in the patient's general mobilisation and independence<sup>7</sup>.

# **PRODUCTS FOR PRACTICE**

These design elements facilitate standardisation of application by clinicians<sup>4</sup>. If any variation in the final appearance of the bandage is noted, then the second component (KPress) can be easily removed and reapplied.

# **Safety**

Within the field of compression therapy, there is some debate surrounding the superiority of elastic and inelastic systems<sup>13</sup>. The KTwo compression system combines both types of bandage materials and eliminates the need to choose between elastic and inelastic systems.

The soft padding provided within the first component (KTech) may help to reduce the risk of pressure damage to vulnerable areas such as the tibial crest and the Achilles tendon. In addition, the application technique does not require the clinician to pull the bandage across the tibial crest, which can cause trauma; rather the bandage is extended and then laid across the front of the shin.

The integral pressure indicators also aid correct application and reduce the potential for variation between clinicians, allowing for continuity of care<sup>4,9</sup>.

KTwo bandages are packaged in boxes that contain both components necessary for each compression system. This lessens the potential errors that can occur when clinicians have to assemble a number of single components to produce the required level of compression. In addition, each kit states the level of compression provided, further reducing the potential for error when calculating the compression levels provided by the various individual components.

The KTwo Reduced compression kit can be easily identified by the green band around the box, green bandage wrapper and the pressure indicator on the KTech bandage has an 'R' printed on it.

### **Cost-effectivessness**

The cost-effectiveness of the KTwo compression system has been demonstrated using a case study approach in a patient with a non-healing venous leg ulcer. Changing the patient's treatment to the KTwo system from a standard short-stretch bandage system reduced the weekly cost of medical supplies and nursing involvement, with a significant overall cost saving to the Trust<sup>14</sup>.

As the KTwo compression bandage system is supplied in a single box, there is no need

to purchase and store large volumes of individual components or kits. This is of great benefit for clinical areas where storage space is at a premium. The minimal suggested requirement would be for two KTwo full compression kits and two KTwo Reduced compression kits.

### **Concordance**

The reduced bulk of the KTwo compression system offers good patient comfort both day and night? This also ensures good ankle mobility and the patient is able to wear normal footwear. This can ultimately reduce healing time as the patient continues to wear the necessary compression required to heal the leg ulcer.

There is anecdotal evidence from clinicians that concordance with compression therapy is increased with the KTwo compression bandage system<sup>9,15,16</sup>. The primary reason for this, is the reduction in bulk <sup>9,17,18</sup>. A secondary factor is that the bandages are cooler to wear, helping to reduce night pain<sup>7</sup>. The combination of elastic and inelastic components can also reduce the pain experienced from fully elastic systems, with the system being comfortable to wear and no bandage slippage<sup>9,17,19</sup>.

## CASE STUDY: MANAGEMENT OF A PRE-TIBIAL LACERATION USING KTWO® COMPRESSION (ADAPTED FROM?)

### BACKGROUND

The patient was an overweight, 60-year-old non-smoker with a past medical history of 'borderline' diabetes, myocardial infarction, pulmonary embolus and she had high cholesterol levels and arthritis. She was on a range of medications including warfarin. Following a bad fall, the patient was treated initially by the district nurse and local GP. She was referred to the wound management team at Southend University Hospital six weeks later with a wound measuring 14cm x 10cm. She was on her fifth course of antibiotics.

### TREATMENT

The wound was infected and she was started on IV antibiotics. Extensive debridement was carried out to remove necrotic tissue and pus (Fig 1). Despite an ABPI of 1.48, the decision was taken to apply compression as the patient was in hospital and could be monitored closely. The KTwo compression system was chosen (25-32cm kit), and as she experienced no side effects, was discharged back into the community following a 10-day hospital stay.

### OUTCOMI

After 19 weeks of treatment with KTwo, and despite continuing warfarin treatment, the patient's extensive wound was virtually healed (Fig 2). She was able to continue her life normally, which was extremely important as her husband was housebound. The patient found the KTwo bandage system extremely comfortable to wear, it wasn't 'thick or heavy, like four-layer' and allowed for good ankle mobility. It stayed in place and she felt much more confident wearing it, compared to the four-layer system she had worn for a previous leg ulcer. The ease and speed of application made a big difference to her clinic visits. The pressure indicator on the bandages allowed for consistent therapy and continuity of care both in the unit and community.

Acknowledgement: Helen Sanderson, Southend University Hospital Wound Management Team. Further case studies can be viewed at: www.woundsinternational.com/made-easys/ktwo-compression-bandage-system-made-easy/



Fig 1: Six weeks after the fall following debridement



Fig 2: 19 weeks after treatment with KTwo

In addition, there is the positive psychological effect on the patient as they are only required to wear two rather than four bandage components, with the presumption that less is better, as demonstrated by a reduction in polypharmacy experienced by the elderly population<sup>20</sup>.

Patient empowerment and integration of self care has been lacking in compression therapy mainly due to the inability of individuals or their carers to apply compression systems. However, carers of patients with lymphoedema and unqualified prison staff have been taught to apply KTwo bandages successfully and this is an

important step towards active patient and carer involvement in compression therapy  $^{21}$ .

# Clinical evidence for KTwo compression system

There are a number of clinical studies that have demonstrated the efficacy,

Table 1 Summary of clinical evidence for the KTwo compression system				
Reference	Title	Туре	Purpose	Outcome
Lazareth et al. J Wound Care 2012; 21(11): 553-65	Efficacy of two compression systems in the management of VLUs: results of a European RCT	Multicentre, randomised controlled trial in France, Germany, and UK	Evaluation of efficacy, tolerance and acceptability of the two-layer KTwo system vs the four-layer PROFORE™ (Smith & Nephew) bandage system in the management of 187 patients. 160 patients were followed until week 12, or until complete re-epithelisation of their wound	Complete closure rates were higher in the KTwo group (44% vs 39%), although time to complete reeplithelialisation was similar in both treatment groups Local adverse event rate in the KTwo group was 12%, and 16% in the PROFORE group There was a greater reduction in pain between dressing changes in the KTwo compared to the PROFORE group KTwo was considered significantly easier to apply
Weindorf et al. Phlebologie 2012; 41: 18-24	[Effect of optic marks on compression bandages on the pressure of compression bandages: First results of a prospective clinical study in different collectives of users]	Comparative clinical trial	Comparison of the interface pressures achieved by different groups of bandagers using a two-layer (KTwo), four-layer (PROGUIDE™, Smith & Nephew) and short-stretch bandages (Pütter, Hartmann). Five nurses, physicians and unqualified persons applied each system three times to the leg of a healthy volunteer. The recommended therapeutic pressure was considered to be at least 40mmHg	Differences in the applied pressures were between 15 and 106mmHg using Pütter bandages and between 20 and 81mmHg for the bandages with optical compression indicators (KTwo and PROGUIDE). The differences were more distinct in the unqualified group
Thompson A, Steventon E. J Community Nurs 2010; 24(6): 37-8	Leg ulcer management: a cost- effectiveness case study	Case study	Evaluation of how evidence-based practice can improve the quality of patient care and reduce costs in a community tissue viability leg ulcer service	A patient with a venous leg ulcer, not previously healed using standard short-stretch bandaging, was reassessed and the KTwo bandage system applied. The ulcer healed in 4 weeks resulting in significant cost savings when compared to the previous fourlayer system used
Jünger et al. <i>J Wound Care</i> 2009; 18: 474-80	Comparison of interface pressures of three compression bandaging systems used on healthy volunteers	Comparative clinical trial	Comparison of changes in interface pressures achieved with three compression systems: KTwo, PROFORE and Actico® (Lohmann & Rauscher) over 7 days. The legs of 24 healthy volunteers were bandaged with one of the three compression systems on both legs. Interface pressures were measured on days 1, 3 and 7 using an air sensor system	After 7 days KTwo maintained a similar level of subbandage pressure to the four-layer system (Profore) and was slightly better than the inelastic system (Actico) KTwo was considered to be more comfortable and tolerable than the other two systems 25% of the patients treated with PROFORE discontinued treatment after 3 days due to pain
Hanna et al. Br J Nurs 2008; 17: 16-24	A comparison of interface pressures of three compression bandage systems	Comparative clinical trial	Comparison of the interface pressures achieved with two-layer (KTwo), four-layer (PROFORE) and an inelastic two-layer (Actico) compression system. 32 experienced nurses applied each of the systems to the leg of a healthy volunteer in a sitting position. The interface pressures and time taken to apply the bandage systems was measured (recommended therapeutic pressure was 40mmHg)	Required therapeutic interface pressure (30-50mmHg) was achieved by 85% of nurses with KTwo (average pressure 40mmHg), 69% with PROFORE and in 25% with Actico 25% of nurses applied high pressures (>50mmHg) with PROFORE; while 75% applied sub-therapeutic pressures (< 30mmHg) with Actico Actico took the least time to apply (mean of 1 min 50 sec). PROFORE took the longest time (mean of 3 min 46 sec). KTwo took a mean time of 2 min 35 sec to apply
Benigni et al. <i>J Wound</i> <i>Care</i> 2007;16: 385-90	Efficacy, safety and acceptability of a new two-layer bandage system for venous leg ulcers (VLUs)	Non- comparative open label clinical trial	Evaluation of the efficacy, tolerability and acceptability of a two-layer bandage system (KTwo) in 42 patients from 12 centres with VLUs (average size 7cm²; average duration 8 months; 62% recurrent)	86% of the patients improved or healed after 6 weeks of treatment (mean surface reduction 58.5%). 24% achieved complete healing. There was an overall reduction in oedema of 83% (from 69% of patients at baseline to 12% at 6 weeks)  Compared with compression therapy used previously, patients reported increased comfort, reflected by 100% concordance with KTwo

tolerability and acceptability of the KTwo compression system (Table 1). It has been shown to reduce oedema, to be easy to apply and have a high level of tolerance by patients<sup>5,7,8</sup>. This data is supported by a recent multicentre, randomised controlled trial comparing KTwo compression with an established four-layer bandage system. Both systems afforded similar efficacy in the management of patients with noninfected venous leg ulcers. However, the KTwo compression system was found to be easier to apply. Complete wound closure was achieved in 44% of patients in the KTwo group and 39% in the four-layer bandage group<sup>22</sup>.

In summary, the following clinical benefits have been reported for KTwo:

- Effective support of wound healing in patients with venous leg ulcers<sup>7,9,20,23</sup>
- Effective sub-bandages pressures after seven days<sup>8</sup>
- Effective and consistent subbandages pressure (despite people with varying skills applying the bandage system)<sup>4,5</sup>
- Safe and easy application of the bandages system<sup>4,9,22</sup>
- Good level of tolerance, concordance and patient comfort<sup>7,9,17,20</sup>.

# References

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It is important that support mechanisms are in place to sustain the effective use of the KTwo compression system. This support is often company led and integrated into in-house training and education systems. There are also ongoing developments to produce bandage competencies, which will provide a standardised clinical skill assessment tool. For further information and resources from Urgo, please go to: www.urgo.co.uk/

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# **Summary**

Best practice for the use of compression in the management of venous leg ulcers is not simply about the ability to apply a bandage to a limb. It involves choosing a system and applying it in such a way that takes into account the patient's individual requirements, the goal of therapy and the stage of treatment<sup>6</sup>. KTwo is a clinically proven, safe, effective compression bandage system for optimising the application of the recommended therapeutic levels of pressure to heal both venous and mixed aetiology leg ulcers. It provides accurate, sustained compression for up to seven days, is easy to apply and encourages patient concordance through improved comfort, whilst providing a cost-effective solution to a challenging medical condition.

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