

An evolution in compression



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Two simple steps to sustained and comfortable compression

References

- 1 Schuren J., Collier, M. Evaluation of ease of use and reproducibility of provided pressures, comparing 3M™ Coban™ 2 Layer Compression System to four currently marketed compression systems. Data on file. 3M Health Care, May 2006.
- 2 Hampton S., et al. Summary of five case studies on the treatment of venous leg ulcers with a new two layer compression system in a community setting. Data on File. 3M Health Care, May 2006.
- 3 Schnobrich E., et al. Seven day in-use assessment of a unique, innovative compression system. Poster presented at the 19th Annual Symposium on Advanced Wound Care and Medical Research, San Antonio, USA, May 2006.

3M Health Care is pleased to introduce an innovation in compression bandaging. The new 3M™ Coban™ 2 Layer Compression System introduces a new level of comfort, effectiveness and convenience for you and your patients.

The 3M Coban 2 Layer Compression System is a comfortable, easy-to-apply compression system that delivers sustained, therapeutic compression for the treatment of venous leg ulcers and related conditions such as lower leg oedema.

Just two steps to comfortable, sustained compression

Step one

Apply the unique foam comfort layer. This layer replaces the orthopaedic wool layer and is latex-free.

Step two

Apply the cohesive compression layer. This layer provides effective, sustained compression and is also latex-free.

Once applied the two layers bond together to form a slim, single-layer bandage that is

designed to resist slippage and enables patients to wear their normal footwear.

Benefits for health-care professionals

- Simplified application and removal
- Easy to train, provides more consistent pressure values¹
- Effective compression for up to seven days¹
- Latex-free.

Benefits for patients

- Reduced slippage^{2,3}
- Improved comfort²
- Patients can wear their normal footwear, maintaining mobility and social activity.³

Important information

- Suitable for patients with an ankle brachial pressure index greater than 0.8
- The Coban 2 Layer Compression System contains two rolls, and is designed to be used as a kit. It should not be used in conjunction with any other orthopaedic wools or compression bandages.

Visit www.3mhealthcare.co.uk for further product information and to download an application poster and patient information leaflet. ■

Foreword

Compression therapy has revolutionised the lives of patients with leg ulceration. Two decades ago there was little hope of healing in such patients, and it was not uncommon to hear from those who had their ulcer for weeks or even decades.

As compression therapy evolved, it became evident that healing was becoming a reality — in some cases, up to 60% at 12 weeks.

One should not underestimate the impact of leg ulceration on a patient's quality of life:

- Up to 80% of patients experience some degree of pain, which affects their life — for example, by disrupting sleep and causing depression or anxiety
- Many have poor mobility, which means they are often unable to get out and consequently become socially isolated.

Compression therapy can change this. It is a major factor in improving quality of life, even if it takes some time to achieve leg ulcer healing. Levels of pain are radically altered within a few weeks of treatment.

While there have been many technological advances in leg ulcer management over the past few years, few have addressed the real clinical challenges that ulceration presents — for example, applying effective compression and preventing slippage, which are major issues for clinicians and patients respectively.

Part of the problem is that patients' limb shapes change over time — they present with 'inverted champagne bottle' legs, loss of calf muscle, or very thin legs. Thus, applying bandages at a consistent pressure and preventing slippage is problematic.

However, the new and simple 3M Coban 2 Layer Compression System may provide the answer to these issues. It is unique in that it incorporates a foam layer to allow for contouring and facilitates 'adhesion' of the outer compression layer, thus preventing slippage. It acts as an elastic bandage to allow sustained pressure — up to one week — and as an inelastic bandage, giving a high working pressure when the patient is walking. This combination adds to the 'stiffness' of the system.

I hope that you, as a practitioner, will like working with the system and that your patients will also see, feel and reap the benefit it allows.

Christine Moffatt

Professor of Nursing, Thames Valley University, London and Director, Centre for Research and Implementation of Clinical Practice, London

Introduction

There can be no doubt that the introduction of compression therapy as a management approach to leg ulceration has made a difference to countless patients, both on a physical and psychological level. After having to live with an ulcer for months or even years, compression therapy, in most instances, facilitates an immediate reduction in pain, exudate and social isolation, along with healing, in approximately 12 weeks.

But even with this good news, many patients still do not have access to, or do not receive, appropriate compression therapy. There may be a myriad of reasons for this, but perhaps the most common is lack of awareness of the various systems and modes of action (long- or short-stretch, multilayer or light), coupled with difficulties in appropriate and effective application.

This supplement aims to address these factors. It outlines some of the issues facing practitioners (who are trying to achieve the correct sub-bandage pressure, and find the right system for their patient) and patients (how leg ulceration can affect their quality of life). It also reflects some practical experiences of using a new two-layer system and its effect on patients' physical and emotional well-being.

I hope you will find it useful to your everyday practice. After all, if a bandaging system is simple to use and, most importantly, effective, why not try it? You have nothing to lose and potentially much to gain.

Deborah Glover

Editor, Journal of Wound Care

Quotes

These patient quotes are taken from individual case studies and do not relate to the presentations summarised in this supplement

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Contributors: front row (left to right), Wendy Hayes, Keith Harding and Patricia Price; middle row, Julie Day and Jan Schuren; back row, Michael Clark and Mark Collier

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Leg ulceration: impact on everyday living and health-related quality of life

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References

- 1 Bland, M. Coping with leg ulcers. *Nurs N Z* 1996; 2: 13-14.
- 2 Charles, H. The impact of leg ulcers on patients' quality of life. *Prof Nurse* 1995; 10: 9, 571-574.
- 3 Chase, S.K., Melloni, M., Savage, A.A. forever healing: the lived experience of venous ulcer disease. *J Vasc Nurs* 1997; 15: 2, 73-78.
- 4 Krasner, D. Painful venous ulcers: themes and stories about living with the pain and suffering. *J Wound Ostomy Continence Nurs* 1998; 25: 3, 158-168.
- 5 Hyde, C., Ward, B., Horsfall, J., Winder, G. Older women's experience of living with chronic leg ulceration. *Int J Nurs Pract* 1999; 5: 4, 189-198.
- 6 Neil, J.A., Munjas, B.A. Living with a chronic wound: the voices of sufferers. *Ostomy Wound Manage* 2000; 46: 5, 28-38.
- 7 Ebbeskog, B., Ekman, S-L. Elderly people's experiences: the meaning of living with venous leg ulcer. *EVMA J* 2000; 1: 1, 21-23.
- 8 Douglas, V. Living with a chronic leg ulcer: an insight into patients' experiences and feelings. *J Wound Care* 2001; 10: 9, 355-360.
- 9 Rich, A., McLachlan, L. How living with a leg ulcer affects people's daily life: a nurse-led study. *J Wound Care* 2003; 12: 2, 51-54.
- 10 Hopkins, A. Disrupted lives: investigating coping strategies for non-healing leg ulcers. *Br J Nurs* 2004; 13: 9, 556-563.

What is it like to live with a leg ulcer?

We have some information on this from various sources:

- Qualitative studies — everyday experiences
- Generic studies — health-related quality of life
- Condition-specific tools.

Qualitative studies

Ten qualitative studies¹⁻¹⁰ have explored, through various methodologies, patients' experiences of living with a leg ulcer:

- In eight studies physical symptoms were a major problem
- In five studies there was a perception that 'no-one listens'
- Seven studies demonstrated a negative psychological experience.

Hyde et al.⁵ undertook a study of 12 women who had been living with leg ulceration for over three years. In a series of interviews they explored:

- Gaining and maintaining control over their limb
- Living with symptoms
- Lifestyle changes/impaired mobility
- Loneliness
- Coping/determination/hope.

Neil and Munjas,⁶ using Heideggerian hermeneutics, interviewed 10 patients with chronic wounds and found that two constitutive patterns with six themes emerged, including contending with the wound and staying at home (staying back from life).

Such issues were also reflected in a study by Ebbeskog and Ekman.⁷ They interviewed 12 women and three men with venous leg ulceration and found that ulceration had affected participants' body image, restricted their lives, caused issues with managing emotions related to pain and led to a cycle of hope versus despair over time.

Rich and McLachlan used descriptive phenomenology as a basis for their study.⁹ This comprised interviews with five females and

three males. Issues arising included:

- Pain
- Lack of consistent care
- Coping with symptoms
- Fear of further injury.

In 2004 Hopkins undertook semi-structured interviews in the UK with five patients with venous leg ulceration.¹⁰ Evaluation, using interpretative phenomenology, threw up a key concept — biographical disruption — which manifests as pain and suffering, social exclusion and an attitude that this is 'part and parcel' of life.

Generic studies

Health-related quality of life, defined as 'the functional effect of an illness and its consequent therapy upon a patient, as perceived by the patient',¹¹ is often used in studies exploring the effect on patients of illness or disease.

Lindholm et al.¹² explored this using the Nottingham Health Profile¹³ in 125 patients (74 female, 51 male). There were gender differences in terms of pain, emotional reaction, social isolation and physical-mobility concepts. They concluded that the impact may be greater on males.

Price and Harding¹⁴ undertook a study involving 63 patients (37 females) using the SF-36¹⁵ tool and found:

- Statistically different scores in seven of the eight subscales
- Gender differences: the impact on females may be greater (which contrasts with Lindholm et al.'s suggestion)
- Patients with ulcers of less than 24 months' duration had less pain and better general health.

Another study, which again used the Nottingham Health Profile, surveyed 758 patients with leg ulcers in six community trusts.¹⁶ This was a cross-sectional study and found that there was poor health-related quality of life in all domains and, in particular,

Female, 61 years *‘[The ulcer] has been improving all the time, but going into the new bandage quickened up the healing process and I never looked back. And now it is completely healed, which is wonderful after eight years’*

that women experienced less energy, disturbed sleep, lack of mobility, emotional reactions, increased physical pain and social isolation.

Condition-specific tools

As the name suggests, these are devised to explore specific domains in regard to defined conditions.

The Cardiff Wound Impact Schedule (CWIS) was devised by Price and Harding in 2004¹⁷ and was validated against the SF-36 tool. It allows the assessment of standard psychometrics, and is sensitive to healing status. It comprises sections on:

- Physical symptoms and everyday living — 12 items: ‘extent of problem’ and ‘associated stress’, each on a five-point rating scale
- Social life — seven items: ‘extent of problem’ and ‘associated stress’, each on a five-point rating scale
- Well-being — seven items: each on a five-point Likert scale.

All scales were transformed to 0–100 point scale on completion.

In a study¹⁷ of 124 patients, the CWIS showed reliability and internal consistency, with the following results:

- Physical symptoms = 0.88 and 0.95
- Social life = 0.96 and 0.93
- Well-being = 0.77.

(Levels over 0.7 are acceptable.)

Mean scale scores by wound status are given in Table 1.

Franks et al.¹⁸ explored health-related quality of life, using the Nottingham Health Profile, in 200 patients (132 female) receiving either single or multilayer bandaging for chronic venous ulceration. Results demonstrated an improvement in all scores over 24 weeks and that four-layer bandaging was associated with a greater improvement in energy and mobility.

In 1999 Franks et al.¹⁹ again explored the effect of bandage systems using the Nottingham Health Profile in a prospective randomised parallel group. A total of 109 patients were

Table 1. Mean scale scores: CWIS by wound status

	Healed (n=46)	Non-healed (n=89)	P value
Physical symptoms	87.6	71.1	<0.0001
Social life	84.7	76.1	0.025
Well-being	50.8	38.7	0.0001
Global QoL	7.2	6.9	NS
Satisfaction with QoL	7.8	6.7	<0.01

CWIS = Cardiff Wound Impact Schedule
QoL = Quality of Life

allocated to receive Profore (Smith & Nephew) and 99 patients to original four-layer bandaging. At study end, 167 patients healed; significant differences in sleep, bodily pain and mobility were found compared with non-healers, but there were no differences in other domains.

Another study²⁰ explored the outcome of four-layer bandaging versus superficial venous surgery. Fifteen participants were given a questionnaire pre-treatment, and then at four and 12 weeks. Loftus devised this questionnaire based on EuroQoL (quality of life).²¹ Both groups improved (surgery p<0.001, four-layer bandaging p=0.019), with no differences between them.

Franks et al.’s study²² again compared four-layer bandaging with short-stretch bandaging on 139 participants (two data points) using the Nottingham Health Profile on entry, trial end and 24 weeks:

- Differences: healed and open (bodily pain p<0.008, emotion p=0.007, social isolation p=0.024)
- No differences between the systems.

Conclusion

We can see from a range of studies using a number of different methodologies that a pattern emerges, such that patients with chronic venous ulceration perceive their quality of life as poor.

Although few in number, studies are beginning to show that appropriate management that includes a good compression system can result in improvements in both quality of life and clinical parameters. ■

11 Van Korlaar, I., Vossen, C., Rosendaal, F.R. et al. Quality of life in venous disease. *Thromb Haemost* 2003; 90: 1, 27-35.

12 Lindholm, C., Bjellerup, M., Christensen, O.B., Zederfeldt, B. Quality of life in chronic leg ulcer patients: an assessment according to the Nottingham Health Profile. *Acta Derm Venereol* 1993; 73: 6, 440-443.

13 Hunt, S.M. Nottingham Health Profile. In: Wenger, N.K., Mattson, M.E., Furberg, C.P., Elinson, J. (eds). *Assessment of Quality of Life in Clinical Trials of Cardiovascular Therapies*. Le Jacq, 1998.

14 Price, P., Harding, K.G. Measuring health-related quality of life in patients with chronic leg ulcers. *Wounds* 1996; 8: 3, 91-94.

15 Ware, J.E., Sherbourne, C.D. The MOS 36-item short-form health survey (SF-36). I: Conceptual framework and item selection. *Med Care* 1992; 30: 473-483.

16 Franks, P.J., Moffatt, C.J. Who suffers most from leg ulceration? *J Wound Care* 1998; 7: 8, 383-385.

17 Price, P.E., Harding, K.G. The Cardiff Wound Impact Schedule: the development of a condition-specific questionnaire to assess health-related quality of life in patients with chronic wounds. *Int Wound J* 2004; 1: 1, 10-17.

18 Franks, P.J., Bosanquet, N., Brown, D. et al. Perceived health in a randomised trial of treatment for chronic venous ulceration. *Eur J Vasc Endovasc Surg* 1999; 17: 2, 155-159.

19 Franks, P.J., Moffatt, C., Ellison, D. et al. Quality of life in venous ulceration: a randomized trial of two bandage systems. *Phlebology* 1999; 14: 95-99.

20 Loftus, S. A longitudinal quality of life study comparing four layer bandage and superficial venous surgery for the treatment of venous leg ulcers. *J Tissue Viability* 2001; 11: 14-19.

21 Kind, P., Dolan, P., Gudex, C., Williams, A. Variations in population health status: results from a UK national questionnaire survey. *BMJ* 1998; 316: 736-741.

22 Franks, P.J., Moody, M., Moffatt, C.J. et al. Quality of life in a trial of short stretch versus four-layer bandaging in the management of chronic venous ulceration. *Phlebology* 2004; 19: 87-91.

Are we too precious about pressures?

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The strength of compression delivered by compression bandage systems is often seen as a key surrogate outcome of their effectiveness. For many years guidance has stipulated that specific pressure levels may be required to achieve a therapeutic benefit — for example, 40mmHg at the ankle, decreasing as the bandage is applied closer to the knee.¹

However, there is no evidence that such thresholds are biologically relevant and universal for all bandage wearers.

There is also awareness that the level of compression applied by a bandage system is a function of several interrelated parameters,² including the:

- Material
- Bandage application technique
- Size and shape of the bandaged limb
- Activities undertaken by the patient while wearing the bandage.

Regardless of these complex issues, compression applied by bandages is often measured, and a wide variety of pressure and force sensors are used to quantify the likely effect of bandage systems. However, there are no common and agreed definitions of the parameters measured in the laboratory or in clinical practice.³

Laplace's law

In an ideal world a bandage system's performance could be predicted using Laplace's law, which relates compression to the tension with which the bandage is applied and the size of the limb being bandaged.

As tension increases for a given leg size, the compression achieved by the bandage should also increase.

Accordingly, if a bandage is applied at a constant tension to legs of increasing size, then the compression should decrease. This is a general rule and, in reality, perfect adherence to Laplace's law is not seen.

Laplace's law predicts that a bandage, if

applied at a constant tension, should apply decreasing compression as the radius of the leg increases as the practitioner moves from the ankle towards the knee — this is graduated compression.

This phenomenon is also hard to find in practice, probably due to the challenges of maintaining a constant tension in the bandage material as the system is applied to the leg.

Interpreting different classifications

There are many approaches to classifying different bandage systems, although interpreting these classifications can be challenging.

For example, the extensibility of a bandage can be used to develop clinically relevant classification schemes. Extensibility refers to the degree to which a bandage system will increase in length when a force is applied to the material, and terms such as 'long-stretch' and 'short-stretch' are in common use. These descriptions are to an extent meaningless in the absence of knowledge of the force applied, as a 'short-stretch' material may extend further in length as the force applied increases.

A further complication is that a long-stretch bandage may shift towards short-stretch behaviour when combined with other bandage materials into a multilayer multicomponent bandage system.

Another technical parameter of growing interest is the stiffness of the bandage material — this property reflects the increase in sub-bandage pressure applied as the leg changes in circumference (for example, during walking).

A simple practical test for indicating stiffness is to measure sub-bandage pressures while the subject sits down and then to repeat these measurements with the subject standing. This static stiffness index should be considered alongside the degree of compression produced by a bandage system, to provide a more comprehensive assessment of the likely

References

1 Stemmer, R. Ambulatory elasto-compressive treatment of the lower extremities particularly with elastic stockings. *Der Kassenarzt* 1969; 9: 1-8.

2 Clark, M. Compression bandages: principles and definitions. In: *Understanding Compression Therapy*. Medical Educational Partnership, 2003, available from www.ewma.org/english/english.htm

3 Partsch, H., Clark, M., Bassez, S. et al. Measurement of lower leg compression *in vivo*: recommendations for the performance of measurements of interface pressure and stiffness: consensus statement. *Dermatol Surg* 2006; 32: 2, 224-232.

Male, 70 years *I found the two-layer bandage was far superior to the four [layer]. I'm a fairly active person and I had no worries whatsoever about the bandage falling down. When you took the four-layer bandage off... I found the leg skin was creased. So, when you put the next bandage on, you had to make certain that the creases were covered, so the next crease would be in a different place because if it was there for more than a fortnight, the skin would break, and it would ulcerate. With the two-layer bandage, there was nothing at all. It was completely smooth all the way down. It seemed to reduce the size of the leg, getting rid of the fluid'*

performance of the bandage when applied to a leg.

There have been relatively few attempts to develop formal bandage classification schemes, with probably the best known being the 1995 British Standard BS7505. This standard presents a range of technical specifications that could be measured and reported to define a bandage system's performance.

Many of these parameters simply consider the amount of compression applied by the bandage. However, material stiffness is reflected by the tension ratio of the material where this measurement gives the change in sub-bandage pressure when the working length of the bandage changes by 3%. By working length, the standard means the length of the bandage material when it is applying the desired level of compression to the leg.

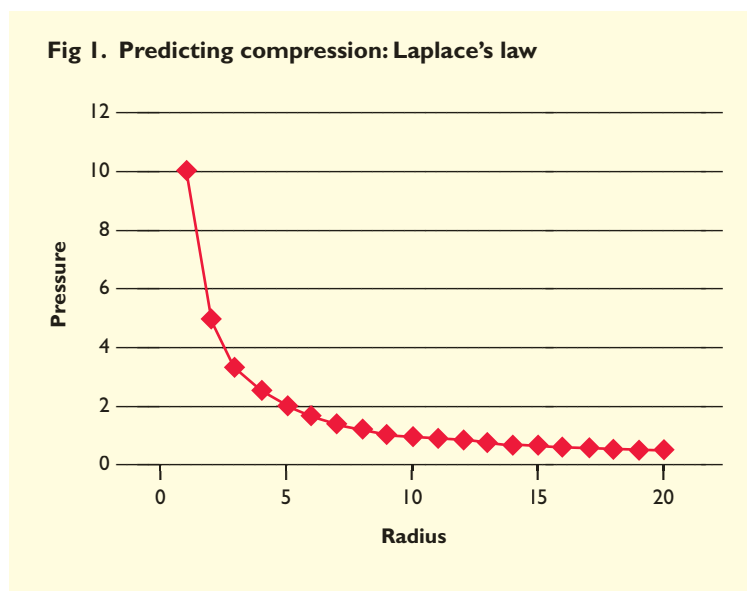
BS7505 classifies compression bandages into four groups, based on their ability to apply specific levels of compression to a 23cm circumference ankle, with a 50% overlap of the bandage between successive layers.

A German standard also classifies bandages into four groups, based on their ability to apply compression. However, specific thresholds vary between standards — for example, a high-compression bandage will apply between 31mmHg and 40mmHg under the UK standard but 36.4mmHg to 46.5mmHg under the German standard.

Some of these differences between classifications may simply reflect different pressure measurement techniques. Clearly, bandagers need to be aware of the classification scheme adopted by different manufacturers if they are to have confidence that two bandage systems are applying similar levels of high compression.

Increasing understanding

While we may all agree that compression is an effective intervention for venous disease, we are



less clear on exactly how the application of compression influences healing and prevention. There are many gaps in our understanding that are yet to be filled. However, one simple, helpful step would be to achieve a consensus on how to test and classify bandage systems across Europe.

At the same time, there is a clear need for further education of bandagers to provide understanding of the technical parameters of a bandage that benefits patients in terms of leg ulcer prevention and healing. ■

Ease of use and reproducibility of five compression systems

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Venous insufficiency is the most common condition leading to leg ulceration.¹ Internationally, management of the condition varies:

- US: Unna's Boot (a non-compliant zinc paste bandage covered with a cohesive bandage)
- UK: multilayer elastic compression is widely used
- Europe and Australia: inelastic short-stretch bandages are standard practice.

In the autumn of 2005 we undertook a study to compare the ease and reproducibility of pressures under the new Coban 2 Layer Compression System with those of four established systems.

Study outline

- Thirty-two experts in the application of compression bandages were invited to participate (the panel)
- Recruitment and data collection were undertaken over a three-month period
- An artificial leg was used for the pressure recordings
- Three pressure transducers (Kikuhime small probe, MediTrade, Soro, Denmark) were used to monitor and record forces
- Transducers were placed on fixed gel cushions as follows: 10cm above lateral malleolus (leg circumference: 22cm); 10cm below the top of the bandage (leg circumference: 33cm); in

between (leg circumference: 27cm) (Fig 1)

- Each panellist applied their most commonly used compression system to the sensed artificial leg, and pressures were recorded three times
- Application of the new Coban 2 Layer Compression System was demonstrated and the panellist was given time to 'practise'
- The panellist then applied the new system to the sensed artificial leg and pressures were again recorded three times. Note: in all cases pressures were recorded immediately after each bandage application. Before each application, all pressure transducers were calibrated to a force of 0mmHg
- The time needed from the beginning of each bandage application until completion, for each of the six bandage applications, was recorded
- Four bandage systems were compared directly with the Coban 2 Layer Compression System: Profore (Smith & Nephew), Actico (Activa), Unna's Boot (Graham-Field Medicopaste & 3M) and Rosidal K (Lohmann & Rauscher).

Before and after all bandage applications, each panellist was asked about the compression bandage technique they used most often.

Questions asked before the bandage application included: how much pressure do you believe is provided by your current system? Why do you believe this pressure is provided by this system? Do you measure the pressure?

Questions asked after the series of bandage applications included: how easy was it to reach and reproduce the desired pressure with your current system? How easy was it to reach and reproduce the desired pressure with the Coban 2 Layer Compression System?

Results

Pre-application

- Average number of times usual compression system was routinely used: 6.7 per week (short-stretch 11; Profore 9.8; Actico 2.9; Unna's Boot 3)



Fig 1. Position of the pressure transducers

Male, 70 years *'If you said to me now this is only an experiment and you would have to go back to the old one, it would devastate me. The new bandages are perfection for me!'*

- 59% believed the system used gave a 'graduated pressure' with a value of 40mmHg at the ankle based on manufacturer's information
- Only one expert had ever used a measuring device in practice.

Post-application: pressures achieved

The panellists applied their usual system three times and then applied the new system three times.

- The pressures provided by the familiar applications were much lower than the applicants expected, especially the pressure values achieved by the Unna's Boot users
- The pressures provided by the Coban 2 Layer Compression System were all higher than the applications the panellists were familiar with
- No bandage application gave true 'graduated compression' as would be expected from the Laplace equation — all values recorded by sensor 2 were higher than with sensor 1.

Pressure reproducibility

The pressure values of the first application were taken as the basis value. Reproducibility was calculated as the percentage difference between the first and second and first and third applications. The statistical software Review Manager 4.2.7 (Cochrane Collaboration 2004) was used to analyse and create the forest plots.

Profore users

Eight panellists normally used this product. We found a significant difference between the reproducibility of pressure when the Coban 2 Layer Compression System was compared with Profore ($p < 0.00001$) (Table 1).

Unna's Boot users

Eight panellists from the US normally used this product. We found no significant difference between the reproducibility of pressure between Unna's Boot and the Coban 2 Layer Compression System ($p = 0.14$).

Table 1. Reproducibility of provided pressures: Coban 2 Layer Compression System versus Profore

	Coban 2 Layer Mean (SD)	Profore Mean (SD)
Sensor 1 (application 2)	7.90 (5.92)	34.62 (24.13)
Sensor 1 (application 3)	10.67 (7.95)	30.92 (14.71)
Sensor 2 (application 2)	5.10 (3.94)	17.35 (13.05)
Sensor 2 (application 3)	5.50 (4.34)	31.80 (17.18)
Sensor 3 (application 2)	10.70 (9.42)	35.37 (38.05)
Sensor 3 (application 3)	8.04 (5.38)	43.28 (26.37)

Table 2. Reproducibility of provided pressures: Coban 2 Layer Compression System versus Unna's Boot

	Coban 2 Layer Mean (SD)	Unna's Boot Mean (SD)
Sensor 1 (application 2)	35.08 (30.16)	54.91 (66.88)
Sensor 1 (application 3)	69.12 (88.61)	45.24 (20.24)
Sensor 2 (application 2)	101.59 (178.42)	64.05 (56.97)
Sensor 2 (application 3)	149.79 (267.89)	53.65 (22.77)
Sensor 3 (application 2)	124.83 (194.81)	38.93 (52.39)
Sensor 3 (application 3)	146.23 (238.97)	45.00 (55.00)

Table 3. Reproducibility of provided pressures: Coban 2 Layer Compression System versus short stretch

	Coban 2 Layer Mean (SD)	Short stretch Mean (SD)
Sensor 1 (application 2)	16.50 (16.35)	54.91 (76.42)
Sensor 1 (application 3)	17.37 (16.26)	59.69 (75.00)
Sensor 2 (application 2)	7.65 (4.74)	81.81 (142.47)
Sensor 2 (application 3)	8.75 (4.64)	76.35 (158.25)
Sensor 3 (application 2)	16.42 (12.91)	36.40 (34.09)
Sensor 3 (application 3)	18.47 (18.78)	31.11 (15.90)

Pressure differences between the three bandage applications were very high in both groups (Table 2). Note: This phenomenon was also observed by Hafner et al.²

Table 4. Reproducibility of provided pressures: Coban 2 Layer Compression System versus Actico

	Coban 2 Layer Mean (SD)	Actico Mean (SD)
Sensor 1 (application 2)	5.13 (3.17)	38.58 (33.10)
Sensor 1 (application 3)	7.33 (4.39)	22.50 (27.41)
Sensor 2 (application 2)	3.34 (2.09)	20.73 (12.66)
Sensor 2 (application 3)	4.05 (3.01)	20.19 (32.30)
Sensor 3 (application 2)	7.97 (5.11)	11.22 (14.79)
Sensor 3 (application 3)	3.70 (4.48)	11.49 (9.25)

Short-stretch (Rosidal K) users

Eight panellists from Germany (four) and the Netherlands (four) normally used this product. There was a significant difference between the reproducibility of pressure between the short-stretch system and Coban 2 Layer Compression System ($p=0.001$) (Table 3). Note: the bandage application techniques varied widely both between the applicators and the countries.

Actico users

Eight panellists normally used this product. There was a significant difference in reproducibility of pressure between Actico and Coban 2 Layer Compression System ($p<0001$) (Table 4).

Post-application questions

After six bandage applications, the panellists were asked how easy it was to reach and reproduce the desired pressure with their current system when compared with Coban 2 Layer Compression System:

- There was no significant difference between the answers of the Unna's Boot, the short-stretch and Actico users. The Profore users, however, judged the ease of reproducibility as significantly higher with Coban 2 Layer Compression System (20/32 said it was 'much better' and 7/32 that it was 'somewhat better'). Note: Likert scale used, 1 = very difficult; 5 = very easy.

Conclusion

This study was performed on an artificial leg, where three sensors were positioned on gel cushions to imitate positioning on soft tissues. Any bandage application to this leg was not influenced by confounding factors such as patient movements, limb position or shape.

Male, 80 years *'I'm less aware of this bandage than I was of the four-layer one. It's quite comfortable, and I can get a sock on over it. With the four-layer bandage, the leg gets very hot and, of course, you're wearing it in bed and it can get very uncomfortable. I'm not aware of this [bandage] at all'*

- The reproducibility of provided pressures with Coban 2 Layer Compression System was significantly 'more accurate' when compared with the currently used systems.

Additionally, this evaluation identified that the system application technique was fast and easy to learn

- It can be concluded that Coban 2 Layer Compression System is easy to use and provides more consistent pressure values than the other four compression systems evaluated.

Potential patient benefits

- The new compression system offers the benefits of sustained compression associated with multilayer systems — the new system has just two layers
- It will enable patients to wear more normal footwear and so improve their mobility opportunities
- The system is likely to be attractive to younger patients with leg ulcers
- All of the above should enhance patients' quality of life.

Potential professional benefits

- All practitioners commented that the new compression system was easy to use and to learn how to apply, and that it felt very secure when applied to their own limb
- All practitioners were able to apply the system more successfully than their more usual compression system
- All patients reported the system to be supportive and comfortable when applied, which enhanced practitioners' confidence in their application technique and their confidence/willingness to use the system again
- All practitioners believed their colleagues would have little trouble understanding the theory underpinning the 'new technique' and in learning how to apply the new system
- Coban 2 Layer Compression System could prove to be very cost-effective for the NHS. ■

References

1 Moffatt, C.J., Franks, P.J. A prerequisite underlining the treatment programme: risk factors associated with venous disease. Prof Nurse 1994; 9: 9, 637-642.

2 Hafner [ref - to come](#)

Full results are available from Mark Collier on mark.collier@ulh.nhs.uk

Practical experiences of 3M Coban 2 Layer Compression System

We undertook an evaluation of this new and unique bandaging system, and at a later date plan to publish detailed case studies that feature this work. Here, we present an overview focusing on four of the patients evaluated.

We recruited 20 patients over a three-month period. All were referred to the acute trust vascular clinic by their GP for assessment of ulcer aetiology, and had been offered multilayer compression therapy for their venous leg ulceration. All had used other types of compression therapy with varying degrees of success.

We aimed to evaluate clinical acceptance,

product performance (bandage slippage and wear time) and quality of life of patients treated with the system.

The patients were seen weekly for six weeks, and their experiences of the Coban 2 Layer Compression System were recorded. The following were undertaken at each visit:

- Photograph old bandage *in situ* and record appearance
- Measure height of old bandage (using same technique each time)
- Record how long bandage was in place
- Measure ankle and calf circumference

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Table 1. Patient details and treatment outcomes

Patient	Ulcer size/ location	Ulcer duration	Wound bed appearance	Previous bandaging system	Attitude at presentation	Outcome
53 years. Female	1.5 x 0.8cm distal gaiter above medial malleolus	Five months	Granulation tissue present but ulcer deteriorating	Multilayer: problems with local trauma and slippage	Conscious of body image. Disillusioned and concerned with effect of ulcer on lifestyle	Ulcer healed in five weeks. No slippage. Happy with look of system. Able to wear own footwear
87 years. Male	6 x 3cm right medial gaiter	Five years. History of recurrent ulceration since teens	Sloughy and static	Multilayer: problems with local trauma and slippage	Stoic but frustrated about effect on quality of life	Wound dimension decreased. Able to wear own foot wear. No slippage
55 years. Male	3.5 x 2.5cm right medial malleolus	24 months. Long history of deep venous incompetence	Granulation tissue and slough	Various compression systems: uncomfortable and problems with footwear	Frustrated with the lack of progress	Initial improvement, but deteriorated due to a number of factors. However, satisfied with system and its comfort
Young intravenous drug user	3 x 2.75cm right medial gaiter	Four months	Predominantly sloughy	Various systems tried, but issues with concordance	Compression did not allow wearing of modern clothes and footwear	Enabled patient to wear choice of footwear/clothes. Some problem with wear at heel. Liked system and wanted to continue, but was non- concordant and lost to follow-up

Male, 83 years *‘[The two-layer bandage] is 100% better, there’s no doubt about it. It’s more comfortable than the other one. Of course, I got to be forever wearing boots — the larger ones, the heavier ones. A least I can get these on [looking at shoes]...no trouble. The old bandages... after two or three days were very uncomfortable...they used to sag, drop down....But this new lot, once they settle down, no problem’*

- Photograph wound with ruler
- Record wound dimensions
- Monitor wound bed
- Select wound-contact layer as appropriate and record
- Measure height of new bandage from the floor to the top of the bandage
- Monitor and record exudate levels
- Monitor and comment on malodour
- Record ease of application and removal
- Record patient’s experience of the bandage.

Table 1 presents examples of the 20 patients’ experiences with the system.

Overall outcomes

Negatives

- This system can only be used on venous ulceration
- Unable to use on mixed aetiology ulceration
- Heel wear for active patients was an issue. When this occurred in one patient there was evidence of bandage slippage, which has the potential to cause tissue damage, although none was seen here
- The system is marketed as a two-piece kit, but this can mean there is insufficient layer 1 padding layer for large legs or legs that require shaping to protect bony prominences
- There was one episode of reported discomfort when extra padding was applied.

Positives

- The system was easy to apply and remove
- Application technique was easy to learn, but like other systems requires skill and competence
- There were no sensitivities to the padding layer

- In cases of heel wear we were able to experiment with layer 2 to overcome this
- The padding layer coped well with ‘normal’ exudate levels
- Patients found the bandages comfortable
- All patients found the bandages aesthetically acceptable and could wear their own footwear and clothing.

Conclusion

We fully acknowledge the limitations of these case studies, especially in regard to issues such as the use of wound-contact layers and the presence of copious exudate. As all of the patients were ambulant, an investigation on the system’s benefits for immobile patients would be useful.

Coban 2 Layer Compression System provided sustained therapeutic levels of compression that patients could tolerate. This in turn improved overall concordance with compression therapy. In most patients, the wound size reduced, and in some cases total healing was achieved. This new system will be a welcome and beneficial addition to the current range of products. ■



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